UNIVERSITÉ DU QUÉBEC À MONTRÉAL

ESSAI CLINIQUE RANDOMISÉ SUR LES EFFETS DE L'EXERCICE DANS LA RÉDUCTION DE LA FATIGUE CHEZ LES FEMMES ATTEINTES DE DÉPRESSION POST-PARTUM

THÈSE

PRÉSENTÉE COMME EXIGENCE PARTIELLE

DU DOCTORAT EN PSYCHOLOGIE

PAR

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ACLS-	*The Aerobic Centre Longitudinal Study*
PAQ.....	*Physical Activity Questionnaire*
ACSM.....	*American College of Sports Medicine*
EPDS.....	*Edinburgh Postnatal Depression Scale*
HAM-D.....	*The Hamilton Rating Scale for Depression*
METs.....	*Metabolic Equivalents*
MFI-20.....	*Multidimensional Fatigue Inventory*
POMS.....	*Profile of Mood Inventory*
PSQI.....	*Pittsburgh Sleep Quality Index*
PSS.....	*Perceived Stress Scale*

Résumé

L'objectif principal de cette étude était d'évaluer l'efficacité d'un programme d'entraînement physique fait à la maison pour diminuer la fatigue physique et mentale chez les femmes en dépression post-partum. Les objectifs secondaires étaient d'explorer les modérateurs et médiateurs de l'effet des exercices à la maison sur la diminution des scores de fatigue physique et mentale. Quatre-vingt-huit femmes dans la période post-partum (4-38 semaines) ayant obtenu un score ≥10 sur l'échelle de dépression postnatale d'Edinburgh (EPDS) ont été recrutées. Les participantes ont été réparties de façon aléatoire dans le groupe d'intervention (n=46) ou dans le groupe contrôle (n=42). Les femmes du groupe intervention ont participé à un programme d'exercice à domicile supervisé pendant 12 semaines. Toutes les participantes ont complété le test de condition physique cardiovasculaire à l'entrée dans l'étude et en post-traitement. Les participantes ont complété une série de questionnaires mesurant les résultats (fatigues physique et mentale) de même que des variables médiatrices et modératrices potentielles à l'entrée dans l'étude, en post-traitement et 3 mois post-traitement.

Basé sur le principe de l'analyse en intention de traiter, les femmes dans le groupe d'exercice sont comparées aux femmes du groupe contrôle et montrent de façon significative, une plus grande diminution de la fatigue physique en post-traitement et à 3 mois post-traitement. Avec l'exercice, on a observé chez les femmes ayant rapporté peu de fatigue physique à l'entrée dans l'étude, une diminution significative de la fatigue mentale en post-traitement. Selon les résultats des régressions linéaires hiérarchiques sur les variables modératrices de l'effet des exercices sur la fatigue physique, les femmes qui commencent à s'entraîner après approximativement 9 semaines post-accouchement et celles avec une meilleure condition physique cardiovasculaire initiale ont montré de plus grandes réductions de la fatigue physique grâce à l'exercice. La sévérité de la dépression au moment de l'entrée dans l'étude n'a pas modéré les effets de l'exercice sur la fatigue physique. Les régressions linéaires hiérarchiques évaluant les variables modératrices de l'intervention sur la fatigue mentale ont montré que l'intervention est efficace pour les femmes qui sont entrées dans l'étude à une période post-partum plus tardive et pour les femmes avec des scores de dépression élevés. La diminution du stress perçu et l'augmentation de la dépense énergétique reliée à l'exercice ont été identifiées comme variables médiatrices des diminutions de la fatigue physique grâce à l'exercice. Dans la période post-partum, la fatigue est un symptôme couramment vécu, et elle peut être amplifiée par la dépression. Ces découvertes montrent que chez les femmes déprimées dans la période post-partum, l'exercice fait à la maison peut réduire les fatigues physique et mentale.

Mots clés : Dépression post-partum, fatigue, exercice physique.

CHAPITRE I

INTRODUCTION

Cette thèse de doctorat s'inscrit dans un programme de recherche plus vaste ayant pour objectif d'évaluer l'efficacité d'un programme d'entraînement physique à domicile dans le traitement de la dépression post-partum. Malgré la prévalence élevée de la fatigue post-partum et la persistance du phénomène, son impact probable sur le pronostic de la dépression de même que sur la qualité de la relation mère-enfant, seulement deux études, jusqu'à maintenant ont évalué les interventions pour diminuer la fatigue post-partum. L'objectif de l'étude actuelle était d'évaluer l'efficacité d'exercices supervisés faits à la maison en vue de diminuer la fatigue chez les femmes déprimées en période post-partum. La thèse doctorale est composée de trois articles. Le premier article présente un examen critique des données expérimentales en ce qui concerne la prévalence, les corrélats et l'impact de la fatigue durant la période post-partum. Il fait la synthèse des données expérimentales probantes pour les interventions visant la diminution de la fatigue. Le deuxième article examine l'efficacité d'exercices supervisés faits à la maison sur la diminution des dimensions physique et mentale de la fatigue chez la femme déprimée en post-partum. Le troisième article explore les médiateurs et les modérateurs des effets sur la fatigue de l'exercice fait à la maison. Cette introduction décrira brièvement la prévalence de la fatigue durant le post-partum, ses corrélats en mettant une emphase particulière sur la relation entre la fatigue et la dépression post-partum, et sur l'impact potentiel de la fatigue et des interventions visant sa réduction. Finalement, nous décrirons comment cette étude participe à l'amélioration des connaissances actuelles.

Prévalence

Comme on pouvait s'y attendre, les études évaluant la présence de la fatigue en début de la période post-partum rapportent des taux élevés de prévalence. Entre la $4^{ème}$ et la $10^{ème}$ semaine post-partum 40% à 60% des femmes rapportent un niveau de

fatigue qu'elles qualifient de problématique (Ansara, Cohen, Gallop, Kung, & Schei, 2005; Thompson, Roberts, Currie, & Ellwood, 2002).

Ces résultats suggèrent que, dans le début du post-partum, les taux de prévalence de la fatigue sont significativement plus élevés que ceux rapportés dans les études qui s'intéressent aux soins primaires (13.6 % to 20%) (Cathébras, Robbins, Kirmayer, & Haton, 1992; Wessley, Hotof, & Sharp, 1998). La présence de fatigue est souvent considérée comme une conséquence normale des responsabilités supplémentaires de la maternité qu'on s'attend à voir se résorber au fur et en mesure qu'il y a adaptation de la mère à l'augmentation des demandes. Jusqu'à maintenant, les résultats des recherches n'offrent aucun soutien à cette hypothèse. Une étude européenne de grande envergure (697 Italiennes et 589 Françaises) mesurait la présence d'épuisement extrême à cinq mois post-accouchement et une autre fois à 12 mois post-accouchement (Saurel-Cubizolles, Romito, Lelong, & Ancel, 2000). À cinq mois post-partum, la prévalence de l'épuisement variait entre 46% et 48.8%. Une augmentation significative du taux de prévalence a été observée dans le temps, pour atteindre 67.5% des femmes qui rapportaient de l'épuisement à 12 mois post-partum. Même si une augmentation des symptômes d'anxiété et de dépression était observée, la relation entre ces symptômes et la fatigue n'a cependant pas été examinée.

Il importe de souligner que même si les taux de prévalence augmentent avec le temps durant la période post-partum, les femmes ont moins tendance à chercher de l'aide ou un traitement (Glazener et al., 1995). Les études de prévalence de la fatigue post-partum ont utilisé des mesures à item unique, s'inspirant en cela des études épidémiologiques sur la fatigue dans la population en général. Cependant, ce type de mesure ne fournit pas d'information sur la sévérité de la fatigue. Même si les études les plus récentes chez d'autres populations ont opté pour une conception multidimensionnelle de la fatigue incluant les dimensions physique et mentale (Berlin, Kop, & Deuster, 2006; Oken et al., 2004), il n'est pas clair si ces dimensions de la fatigue sont présentes de façon similaire dans la période post-partum.

Déterminants de la fatigue en post-partum

Il y a un consensus grandissant concernant le fait que la fatigue est, de par sa nature multidimensionnelle et que des facteurs physiologiques, psychologiques et comportementaux modulent l'expression de ces dimensions physique et mentale (Torres-Harding, & Jason, 2005).

Déterminants physiologiques

Seulement un nombre limité d'études ont examiné les déterminants physiologiques de la fatigue en post-partum. Les changements métaboliques durant la grossesse et en post-partum, ainsi que la possibilité de perte de sanguine importante lors de l'accouchement augmentent le risque d'anémie chez les nouvelles mères (Pugh & Milligan, 1993). La présence d'anémie limite la capacité des muscles de compléter les processus d'oxydation, ce qui affect l'endurance et la fatigue musculaire (Dallman, 1986). Cependant, les résultats des études sont contradictoires en ce qui concerne l'importance des niveaux d'hémoglobine ou d'autre indicateur d'anémie reliés à la fatigue post-partum (Bozoky & Corwin, 2002; Lee & Zaffke, 1999).

Dans des populations médicales, les concentrations de certaines hormones, telles les altérations des niveaux de corticostéroïdes ont été associées à des symptômes de fatigue (Klimas, Fletcher, Maher & Lawrence, 2005). Ces mêmes hormones ont aussi été associées au stress, à la dépression ainsi qu'à l'interruption du cycle de sommeil (Klimas et al., 2005). De plus, les altérations des niveaux de corticostéroïdes sur des périodes prolongées peuvent diminuer l'efficacité de la réponse du système immunitaire (Kiecolt-Glaser McGuire, Robles, & Glaser, 2002). Une étude transversale a évalué le lien entre la fatigue, les taux de cortisol ainsi que d'autres hormones liées à la production de lait maternel et ses propriétés (prolactine, taux de mélatonine dans le lait) (Groër et al., 2005). Les auteurs ont aussi évalué l'association entre les symptômes de fatigue et les symptômes auto-rapportés d'infection des mères et de leurs nourrissons (Groër et al., 2005). Il n'y a pas eu d'association significative entre la fatigue et les taux de cortisol. Les mères qui

rapportaient plus de fatigue et de somnolence avaient des taux matinaux plus élevés de mélatonine dans le lait. Selon les auteurs, la mélatonine dans le lait maternel peut affecter le cycle de sommeil du nourrisson et conséquemment la sévérité de fatigue de la mère. Une corrélation significative, mais faible a été trouvée entre les scores d'infections maternelles et la fatigue entre la 4ème et 6ème semaine post-partum.

Les processus inflammatoires tels que mesurés par des concentrations élevées de cytokine pro-inflammatoire interleukine-1 bêta (IL-1β) ont été associé à des symptômes de fatigue dans divers populations médicales (Klimas et al., 2005). Plus particulièrement, la fatigue associée à des concentrations élevée de IL-1β permet la conservation d'énergie qui favorise la récupération suite à un stress aigu ou une maladie (Klimas et al, 2005). A 7 et 14 jours post-partum, des concentrations élevées de IL-1β ont été associées avec la fatigue rapportée à 14 et 28 jours post-accouchement (Corwin Bozoky, Pugh, & Johnston, 2003). Cependant, des facteurs comme le stress et les humeurs dépressives qui sont aussi associées à des concentrations élevées d' IL-1β, n'ont pas été mesurés dans cette étude.

Comme dans le cas de la fatigue dans d'autres populations, les symptômes initiaux de fatigue peuvent être causés par des problèmes de santé ayant des mécanismes biologiques sous-jacents spécifiques (anémie, infections). Cependant, des facteurs différents peuvent être responsables du maintien de la fatigue (stress, dépression, sommeil entrecoupé, et perte d'activité physique) compliquant ainsi la recherche des corrélats physiologiques sous-jacents.

Parité et mode d'accouchement

La plupart des études ne trouvent aucune association significative entre parité et fatigue (Glazner et al., 1995; Schytt, Lindmark, & Waldenstrom, 2005; Thompson et al., 2002; Waters & Lee, 1996). Cependant, ce résultat se retrouve le plus souvent dans les études de prévalence qui mesurent la présence ou l'absence de fatigue et ne sont donc pas sensibles aux différences de sévérité de fatigue entre les femmes primipares et multipares.

L'accouchement par césarienne ou celle assistée par forceps ont été associés à plus de fatigue en début de post-partum comparé à l'accouchement sans assistance, mais les différences entre les modes d'accouchements deviennent moins significatives au fur et à mesure qu'on s'éloigne du moment de l'accouchement (Glazner et al., 1995; Groër et al., 2005; Thompson et al., 2002). Une partie de l'association entre l'accouchement par césarienne et la fatigue peut être expliquée par un risque accru de problèmes physiques suite à une intervention chirurgicale (McGovern et al., 2006).

Dépression

La dépression post-partum se produit chez 10-16 % des femmes avec des symptômes dépressifs qui peuvent durer jusqu'à un an après l'accouchement (Cox , Murray, & Chapman, 1993). La fatigue est un des symptômes physiques auto-rapportés le plus fréquent de la dépression (Tylee, Gastpar, Lepine, & Mendelwicz, 1999). Les études épidémiologiques longitudinales dans la population générale démontrent une relation bi-directionnelle entre dépression et fatigue dans laquelle la dépression prédit la fatigue et la fatigue prédit la dépression (Addington, Gallo, Ford, & Eaton, 2001), soulignant ainsi l'importance de l'évaluation de la relation entre dépression post-partum et fatigue.

Plusieurs études démontrent les mêmes associations entre la sévérité de la fatigue et les humeurs dépressives dans la période post-partum (Brown & Lumly, 2000; Troy, 1999). Cependant les devis de ces études ne permettent pas d'évaluer la direction de la relation entre fatigue et humeur dépressive, non plus que de contrôler l'humeur dépressive préexistante (c.-à-.d. des humeurs dépressives antérieures à l'accouchement) (Bozoky & Corwin, 2002; Corwin, Brownstead, Barton, Heckard, & Morin, 2005).

Dennis et Ross (2005) ont contrôlé l'effet confondant potentiel d'une dépression préexistante en étudiant la relation entre dépression et fatigue à une semaine post-partum dans un échantillon de femmes ayant coté sous le seuil indicatif d'une dépression probable sur l'échelle de dépression post-natale d'Edinburgh

(EPDS). Les humeurs dépressives, le patron de sommeil de l'enfant et la fatigue maternelle ont été mesurés à 4 et 8 semaines post-partum. À 4 semaines post-partum, 42.1 % des mères rapportent qu'elles se sont souvent senties fatiguées comparativement à 36.3 % à 8 semaines post-partum. Les analyses de régression logistique montrent qu'une fréquence élevée de fatigue (*OR* 5.99, $p = 0.02$) à 4 semaines post-accouchement, combinée à d'autres variables, prédisait de façon significative un résultat indiquant une dépression probable à 8 semaines post-partum mesurée par l'EDPS.

Les données probantes disponibles suggèrent que l'humeur dépressive post-partum augmente la fatigue et que la fatigue sévère peut être un facteur de risque du développement de la dépression post-partum (Bozoky & Corwin, 2002; Corwin, Brownstead, et al., 2005 ; Dennis & Ross, 2005). Il convient de noter que dans une étude épidémiologique longitudinale qui a examiné l'association entre la détresse psychologique et la fatigue dans un échantillon de patients en soins primaires, les patients souffrant à la fois de fatigue prolongée et de détresse psychologique avaient plus tendance à demeurer symptomatiques au suivi de 12 mois comparativement à ceux qui rapportaient seulement de la détresse psychologique ou seulement de la fatigue (Hickie, Koschera, Hadzi-Pavlovic, Bennett, & Loyd, 1999).

Stress

Étant donnée l'augmentation soudaine des demandes et des changements de vie associés à l'arrivée du bébé, il n'est pas surprenant que le stress soit accru dans la période du post-partum immédiat. Les études montrent de façon cohérente des associations significatives entre un niveau plus élevé de stress et une intensité de fatigue plus forte (Corwin et al., 2005; Groër et al., 2005; Wambach, 1998). Cependant, ces études avaient des limites au niveau de la taille des échantillons et de la durée trop courte des périodes de suivi. En conséquence, au-delà des deux premiers mois post-partum la relation entre le stress et la fatigue demeure inconnue.

Sommeil

Les perturbations du sommeil sont fréquentes en post-partum. Les nouvelles mères sont réveillées plus souvent la nuit et demeurent aussi plus longtemps éveillées que les mères contrôles non post-partum (Swain, O'Hara, Starr, & Gorman, 1997). Peu importe la méthode de mesure (auto-rapport, mesures actigraphiques au poignet ou polysomnographiques), les perturbations du sommeil sont associées de façon identique à une plus grande fatigue dans la période post-partum (Dennis & Ross, 2005; Gay, Lee, & Lee, 2004; Wambach, 1998; Waters & Lee, 1996).

Impact de la fatigue post-partum

La fatigue persistante au cours des 18 premiers mois a été associée à une moins bonne santé physique à 18 mois (Parks Lenz, Miligan, & Han, 1999). En regard de l'impact de la fatigue persistante sur le développement de l'enfant, les résultats au test de coordination main-œil et les niveaux de performance développementale étaient significativement meilleurs pour les enfants des mères qui ne souffraient pas de fatigue persistante.

Dans une autre étude, les rapports maternels sur la sensation d'être très fatiguée ou épuisée étaient associés avec une moins bonne qualité d'interactions mère-enfant, et ce, à la fois chez les mères déprimées et les non-déprimées (Righetti-Veltema, Conne-Perréard, Bousquet, & Manzano, 2002).

La fatigue ou le manque d'énergie peuvent interférer avec la rapidité du retour des femmes à un état de fonctionnement complet suite à la naissance de l'enfant. Le niveau d'énergie physique à 3 semaines, 6 semaines et 6 mois post-partum, est un des prédicteurs les plus solides du statut fonctionnel de la mère pour les activités d'entretien de la maison, les activités sociales et communautaires et les activités de soins personnels (Tulman, Fawcett, Groblewski, & Silverman, 1990).

Globalement, la fatigue semble être un problème persistant durant le post-partum et il peut avoir un impact négatif sur le développement de l'enfant, sur le retour de la mère à un état de fonctionnement normal et sur la qualité de la relation

mère-enfant. Cela souligne l'importance de développer des interventions pour atténuer ce symptôme en post-partum et aussi de bien les évaluer.

Méthodes pour diminuer la fatigue

Jusqu'à maintenant seulement deux études ont évalué les interventions visant la diminution de la fatigue en post-partum. Thome et Adler (1999) ont évalué l'efficacité d'une intervention téléphonique visant à atténuer la fatigue. Les femmes ayant un score élevé à l'index de stress parental et qui ont obtenu un score ≥ 12 à l'EPDS étaient réparties au hasard soit dans le groupe intervention ou dans le groupe contrôle. Les femmes du groupe d'intervention recevaient jusqu'à cinq appels au cours d'une période de 2 mois. Les femmes ont reçu de l'information et des conseils et ont bénéficié aussi d'une écoute empathique. Les femmes dans le groupe contrôle ont complété les questionnaires au début et à la fin de la période de 2 mois. Les auteurs rapportent que l'intervention a été efficace pour diminuer les niveaux de fatigue. Cependant les items portant sur la fatigue et sur le sommeil ayant été combinés pour les analyses de variance, il n'est pas clair si les effets observés sont dus aux changements au niveau de la fatigue, du sommeil ou des deux. L'intervention s'est aussi révélée efficace pour diminuer les scores de dépressions.

Dans un échantillon de 68 femmes primipares, Troy et Dalgas –Pelish (2003) évaluèrent l'efficacité d'un guide d'autosoin décrivant huit sources de fatigue (ex. stress, anémie, douleur) de même que des suggestions pour la gestion de ces sources (ex. Essayez d'organiser votre journée afin de vous reposer lorsque le bébé dort). Après répartition au hasard des participantes, les femmes qui étaient dans le groupe expérimental ont reçu une copie du guide à une semaine post-partum et ont reçu la consigne de l'utiliser chaque fois qu'elles se sentiraient fatiguées. Les femmes du groupe contrôle ont simplement complété les mesures de fatigue au même moment que le groupe expérimental. Une diminution significative de la fatigue matinale a été obtenue au cours des 4 premières semaines dans le groupe expérimental, mais lorsque l'intervention complète de 6 semaines a été évaluée, il n'y a pas eu de différence

significative entre les deux groupes. Les auteurs n'ont pas mesuré les humeurs dépressives et ne les ont par conséquent pas contrôlées non plus. De plus, les effets à long terme de cette intervention ne sont pas connus.

Un relevé récent des données épidémiologiques portant sur l'activité physique et les sensations d'énergie et de fatigue a montré que les activités physiques sont associées à une réduction de 40% du risque d'éprouver un manque d'énergie ou de la fatigue et ce, dans différents segments de la population (Puetz, 2006). De plus, dans une méta-analyse récente portant sur des interventions d'entraînement à l'exercice, Puetz, O'Connor et Dishman (2006) rapportent que l'exercice diminue les sensations de fatigue et augmente le niveau d'énergie de façon cliniquement significative avec une taille d'effet de 0.37. Même s'ils n'ont pas mesuré directement la fatigue, Koltyn et Schultes (1997) ont trouvé que suite à une session de 60 minutes d'exercices, les femmes, lors de la période de 6-20 semaines post-partum, rapportaient significativement plus de vigueur comparativement à celles du groupe contrôle qui ne s'étaient que reposées durant cette période de 60 minutes.

Objectifs de la thèse

Il a été démontré de façon répétée que le phénomène de fatigue était beaucoup plus prévalent dans les études sur le post-partum que dans les études portant sur la population en général. Paradoxalement, la fatigue semble persister, voir même augmenter en prévalence, au fur et à mesure qu'on s'éloigne du moment de l'accouchement. La fatigue serait accrue par les humeurs dépressives du post-partum et la fatigue sévère serait prédictive du développement de la dépression post-partum.

Les deux études d'intervention ciblant la fatigue post-partum ont une portée restreinte en raison de leurs suivis de courte durée et leurs faiblesses méthodologiques. Il est démontré de façon assez évidente que l'activité physique est associée à une réduction de la fatigue dans plusieurs populations différentes. De plus, l'exercice régulier semble être une des interventions émergentes les plus efficaces pour réduire la fatigue (Puetz et al., 2006). Il est donc étonnant que des interventions

axées sur l'exercice pour diminuer la fatigue post-partum n'aient pas encore fait l'objet d'études empiriques.

Les objectifs de la présente thèse sont les suivants:

1. Évaluer si un programme supervisé d'exercices à la maison est efficace pour atténuer les fatigues physique et mentale chez des femmes déprimées en post-partum.
2. Déterminer quels sont les sous-groupes de femmes déprimées en post-partum qui ont le plus bénéficié du programme supervisé d'exercices à la maison (modérateurs) et étudier les mécanismes par lesquels ces effets bénéfiques se produisent (médiateurs).

Cette étude est le premier essai clinique randomisé évaluant l'exercice en tant qu'intervention valable pour la fatigue post-partum. Étant donné la prévalence de la fatigue et l'absence d'options d'interventions évaluées de façon empirique pour les femmes durant la période post-partum, cette étude aidera à mieux guider les recommandations de traitements. De plus, nous avons ciblé une population où la fatigue est amplifiée et peut avoir des impacts sur le pronostic de la dépression post-partum. Finalement, il y a peu de données sur les différentes dimensions de la fatigue durant le post-partum. En ayant une conception multidimensionnelle de la fatigue et en la mesurant en conséquence, cette étude fournira une meilleure compréhension du rôle des dimensions physique et mentale de la fatigue dans le contexte du post-partum.

CHAPITRE II

LA FATIGUE POST-PARTUM: PRÉVALENCE, CORRÉLATS, IMPACT ET LES INTERVENTIONS VISANT SA RÉDUCTION

Résumé

La fatigue est fréquente dans la période post-partum et peut avoir un impact négatif sur le statut fonctionnel de la mère et sur la dyade mère-enfant. Dans cet article, nous examinerons les données empiriques probantes disponibles en ce qui concerne la prévalence, les corrélats et l'impact de la fatigue post-partum. Nous soulignerons aussi le nombre limité de données probantes portant sur les interventions visant la réduction de la fatigue durant le post-partum. Les études disponibles démontrent que la fatigue est prévalente dans le début du post-partum et persiste à des taux similaires ou plus élevés jusqu'à 12 mois après l'accouchement. Les naissances par césarienne, le sommeil interrompu et les humeurs dépressives ont été reliés à une plus grande sévérité de la fatigue. Les données préliminaires indiquent que la fatigue est un facteur de risque significatif dans le développement de la dépression post-partum. De plus, la fatigue est associée à un statut fonctionnel maternel inférieur et à une qualité moindre de la relation mère-enfant. Les deux études d'intervention ciblant la fatigue post-partum ont une portée restreinte en raison de leurs suivis de courte durée et de leurs faiblesses méthodologiques. L'exercice régulier semble être une des interventions émergentes les plus efficaces pour réduire la fatigue chez d'autres populations mais n'a pas encore fait l'objet d'études empiriques dans la période post-partum. Des essais contrôlés randomisés devront être faits afin de déterminer si l'exercice est une intervention valable pour réduire la fatigue post-partum.

Mots clés : Fatigue en postpartum, déterminants, dépression post-partum, recensions des écrits.

Running Title: POSTPARTUM FATIGUE

Postpartum Fatigue: A Review of the Prevalence, Correlates and Interventions for its Alleviation

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Abstract

Fatigue is common during the postpartum period and may negatively impact maternal functioning and the mother-infant dyad. In this article we review the available empirical evidence on the prevalence, correlates and impact of postpartum fatigue. We also review the limited evidence on interventions for the alleviation of fatigue during the postpartum.

Available studies suggest that fatigue is prevalent in the early postpartum and persists at similar or higher prevalence rates up until 12 months post-delivery. Caesarean deliveries, assisted vaginal deliveries, fragmented sleep and depressed mood have been related to greater fatigue severity. Preliminary evidence suggests that fatigue is a significant risk factor for the development of postpartum depression, that it is associated with lower maternal functional status and poorer quality of the mother-infant relationship. The two published intervention studies targeting postpartum fatigue are limited by short follow-up periods and methodological weaknesses. Regular exercise is emerging as one of the most effective interventions in alleviating fatigue in other populations but has received no empirical attention during the postpartum. Randomized controlled trials are needed to determine if exercise is a viable intervention for alleviating postpartum fatigue.

Key Words: Postpartum fatigue, correlates, postpartum depression, review.

Introduction

The postpartum period is a time of increased demands on maternal physical and emotional resources. It is not surprising that fatigue is a highly common morbidity, with prevalence rates ranging between 40% and 69.4 % depending on the method and time of assessment (1-4). While it is generally assumed that postpartum fatigue self-resolves along with other pregnancy or delivery related symptoms, up to 67.5% of women report severe fatigue at 12 months post-delivery (5). This rate is considerably higher compared to epidemiological studies of primary care patients, where rates vary between 13.6 % to 20% (6, 7). Certain aspects of the postpartum context such as interrupted sleep, disruption in physical activity, and presence of depressed mood, may contribute to the persistence and aggravation of what under other circumstances would be a time-limited phenomenon.

While there is yet to be a consensus on a widely accepted definition of fatigue, it is generally considered to be a subjective experience involving a perception of reduced capacity to complete mental and physical activities (8). Hence, fatigue can encompass physical and mental dimensions and each of these aspects can be associated with a variety of physical, psychological and behavioural factors (8). However, whether a symptom manifestation of a particular disorder (e.g., postpartum depression) or a consequence of the postpartum context (e.g., interrupted sleep, decreased physical fitness following pregnancy or increased body mass index), fatigue can cause important disruptions in physical and mental functioning of mothers and consequently affect the mother-infant dyad (9, 10).

The objectives of this review were the following: Firstly to examine the available evidence on the prevalence of fatigue during the postpartum. Secondly to review studies examining demographic, physiological, behavioural and psychosocial correlates of postpartum fatigue. Thirdly to review studies examining the impact of postpartum fatigue and fourthly to examine the empirical evidence on interventions to alleviate fatigue during the postpartum. To date, few studies have evaluated

interventions for the alleviation of postpartum fatigue, hence we will draw on intervention studies in other populations. Finally, we conclude by summarizing some of the limitations of the current knowledge and discussing future directions.

Method

Data Source

Searches were conducted on Medline, PsychInfo, CINAHL, Cochrane Library online from 1966- December 2006. Combinations of the following search terms were used: "fatigue", "postpartum", "maternal", "tiredness", "tired", "maternal health", "intervention". All English and French abstracts were reviewed. Additional articles were identified through the reference list of reviewed articles.

Data Selection

We included all articles reporting original data on postpartum fatigue as well as on interventions for its alleviation. Thirty studies reporting original data were identified. One study reporting original data was excluded because of a retrospective design assessing incidence of postpartum fatigue up to 12 years following delivery. Two studies were excluded because they focused on specific populations (mothers with Multiple Sclerosis, mothers with triplets).

Results

Twenty-seven studies were included in the review (25 reporting on prevalence, correlates and impact of fatigue and 2 reporting on interventions for the alleviation of postpartum fatigue). Table 1 summarizes the studies on the prevalence, correlates and impact of post-partum fatigue. Table 2 summarizes the intervention studies.

Prevalence

Fatigue prevalence rates in the postpartum are mostly available through general inquiries on maternal postpartum morbidity. As may be expected, studies evaluating the presence of fatigue in the early postpartum period report high prevalence rates. Between 40% and 60% of women report fatigue as being problematic for them at 4 to 10 weeks postpartum (1,2). Fatigue appears to be slightly more prevalent in mothers who were planning to resume employment in the postpartum, with 63.8 % of women reporting problematic symptoms of fatigue (3).

At 16 weeks to 24 weeks postpartum, approximately 49% of women report fatigue (2). Slightly higher prevalence rates were reported at 6 to 7 months post-delivery in a sample of 1336 Australian women, with 69.4 % of women acknowledging that fatigue had been a problem (4).

While these findings suggest high prevalence rates of fatigue in the early postpartum, the presence of fatigue may be considered as a normal consequence to the additional responsibilities of motherhood that self-resolves as mothers adapt to the increased demands and as infants mature. Empirical finding to date offer no compelling support for this hypothesis. In a large-scale study, fatigue prevalence rates were assessed at 1, 3, 6, 9 and 12 months post-delivery in a sample of 436 primiparous women (11). Highest prevalence rates were observed at one month postpartum with slightly more than 40% of women reporting fatigue. While the rates gradually decreased over time, fatigue persisted throughout the follow-up period.

Glazener et al., (12) assessed maternal morbidity in a sample of 1249 women while extending the follow-up period to 18 months postpartum. Morbidity was assessed by asking women to indicate whether they had experienced a list of health problems including tiredness. At 1 to 12 days post delivery 42 % considered that tiredness had been a health problem and 40% indicated that they had been treated professionally for it. At 8 weeks 59% of the women reported tiredness but only 21% reported being treated for it. At 12 to 18 months 54 % reported fatigue and only 7% sought treatment. The findings of this study underscore not only the persistence of fatigue but also that, as time progresses, women are less likely to seek help.

In another study with 697 Italian women and 589 French women, the presence or absence of extreme tiredness was assessed at 5 months post-delivery and again at 12 months post-delivery (5). Forty-six percent of the Italian sample and 48.8% of the French sample reported extreme tiredness at 5 months postpartum. A significant increase in prevalence rates was noted with time, with 60.7% of the Italian sample and 67.5% of the French sample reporting extreme tiredness at 12 months postpartum. While an increase in anxiety and symptoms of depression was also

observed over time, the relationship between these symptoms and fatigue was not examined.

Similar prevalence rates were reported in a cohort study of 2413 Swedish women, with 57.8 % of the participant rating fatigue as being a problem at one year post-delivery (13).

In sum, fatigue is heightened in the early weeks following delivery and prevalence rates remain at similar levels or increase at 12 to 18 months post delivery. It is noteworthy that while prevalence rates increase as the postpartum period progresses, women are less likely to seek treatment or help. As with epidemiological studies of fatigue in the general population, fatigue was assessed with single-item measures, providing little information on the severity of fatigue or whether both physical and mental dimensions of fatigue are similarly heightened in the postpartum period. Importantly, reported prevalence rates have not been adjusted for potential cofounders such as postpartum depression.

Correlates of Fatigue in the Postpartum

There is growing consensus that fatigue is multidimensional in nature with physiological, psychological and behavioural factors modulating the expression of its physical and mental dimensions (8). While prevalence studies suggest that fatigue is common and persistent during the postpartum, only selected correlates have received empirical attention.

Physiological Correlates

Only a handful of studies have examined physiological correlates of fatigue in the postpartum. Given the metabolic changes that accompany pregnancy and the postpartum and the potential of significant blood loss during delivery, some authors have examined the relationship between physiological markers of anaemia (ferritin levels, haemoglobin levels) and fatigue severity. Lee et al., (14) report that fatigue at one month postpartum was associated with low 3rd trimester ferritin levels, while fatigue at 3 months post-delivery was associated with concurrent low ferritin level and low haemoglobin level. It is noteworthy that only two out of the thirty

participants had low haemoglobin levels at 1 month postpartum and all participants had normal levels by 3 months post-delivery.

In another study, finger prick haemoglobin levels were evaluated at 7, 17 and 28 days postpartum along with self-reports of fatigue (15). Haemoglobin concentrations were not related to fatigue at any of the assessment points. While fatigue was measured with a questionnaire consisting of physical and psychological symptoms, comparisons were based only on total fatigue scores.

In another line of research, hormones related to fatigue in other populations (cortisol) as well as the relationship between fatigue and the hormones related to the production and properties of breast milk were evaluated. Groër et al., (16) evaluated the cross-sectional association between fatigue, hormone levels (cortisol, prolactine, milk melatonin levels), and self-reported symptoms of infection in mothers and in their infants. Fatigue was assessed using the Profile of Mood Inventory (POMS) fatigue/inertia scale. There were no significant associations between cortisol levels and fatigue. A weak but significant correlation was found between maternal infections scores and fatigue 4 to 6 weeks postpartum. Mother and infant infection scores were associated with greater sleepiness. Lower serum prolactin was associated with higher depression scores but not with greater fatigue. Mothers reporting greater fatigue and sleepiness had higher melatonin levels in their morning milk. While the authors acknowledge that the exact function of prolactin and melatonin levels is not yet known in human infants, they hypothesize that melatonin milk levels may contribute to the developmental neuroendocrinology of the infant sleep-wake cycle. The infant sleep-wake cycle may in turn influence maternal sleep-wake cycle and consequently impact fatigue levels.

Inflammatory processes as measured by elevated concentrations of pro-inflammatory cytokines interleukin-1 beta (IL-1β) have been correlated with fatigue severity in patients suffering from a variety of chronic medical conditions (cancer, rheumatoid arthritis, chronic fatigue) (17). In the postpartum IL-1β urine concentration levels at 7 days and 14 days postpartum have been correlated with self

reported fatigue at 14 and 28 days post-delivery (18). While this finding is consistent with studies in the medical population, as suggested by the authors of the study possible confounders such as stress or depressed mood, that may also produce changes in inflammatory processes, were not assessed.

The state of knowledge on physiological correlates of postpartum fatigue is reflective of the state of knowledge for fatigue in general (17). While initial symptoms of fatigue may be caused by health problems with precise underlying biological mechanisms (anemia, infections), different factors may be responsible for maintenance of fatigue (stress, depression, fragmented sleep, lack of physical activity), complicating the search for underlying physiological correlates.

Parity

Parity has not been consistently associated with fatigue in the postpartum. One study evaluating the association between parity and fatigue found higher energy levels in the group of multiparous women at 1 month postpartum (14). However, the reverse was found at 3 months postpartum with primiparous mothers reporting higher energy scores.

In another study of 31 women, no significant differences were obtained between primiparous and multiparous women, other than a statistical trend for an increase in fatigue in the primiparous group from the third trimester to 1 month postpartum (18).

Studies on the prevalence of morbidity in the postpartum consistently report an absence of statistically significant associations between parity and fatigue in the first few weeks postpartum as well as at the 12 to 18 months follow-ups (2, 12, 13). However, prevalence studies assess the presence or absence of fatigue and may not be sensitive to differences in fatigue severity between primiparous and multiparous women.

Method of delivery

In one study, delivery by caesarean section was associated with greater fatigue levels at 4 to 6 weeks postpartum (16). Similarly, in another study reporting on the

association between method of delivery and maternal morbidity, women having delivered their babies through caesarean sections reported more exhaustion in the first 8 weeks post delivery, however no significant differences were obtained at16 weeks postpartum, and at 17 to 24 weeks (2). A third study evaluating fatigue in the early postpartum reports greater levels of morning fatigue at 2 weeks postpartum in mothers reporting longer labours (19).

In another study method of delivery was found to be unrelated to the presence of fatigue at 1, 3, 6, 9 and 12 months postpartum (11). The lack of association may partially be explained by the relatively lower prevalence rates of fatigue reported in this study (40% at one month postpartum).

Glazner et al., (12) compared tiredness levels in women delivering by spontaneous vaginal delivery, by assisted vaginal deliveries or by caesarean sections. At two weeks postpartum there were significant differences in tiredness based on method of delivery. The lowest prevalence of fatigue was observed in women with spontaneous vaginal deliveries and the highest in women with assisted vaginal deliveries. At 8 weeks postpartum women with assisted vaginal deliveries and caesarean sections report similar rates of tiredness and these rates were significantly higher compared to women having delivered spontaneously. The differences were no longer significant at 12 to 18 months.

It appears that caesarean deliveries and assisted vaginal deliveries may be associated with greater fatigue in the early postpartum, but the differences between methods of delivery become less significant as time since the delivery elapses. To date none of the studies differentiate between emergency and planned cesareans as these may differentially affect physical and emotional recovery from the labour and delivery. Part of the association between caesarean-section deliveries and fatigue may be explained by an increased risk of experiencing physical problems following such a procedure (3). The presence of physical problems may in turn aggravate fatigue related to the postpartum transition.

Depression

Fatigue is one of the most common self-reported somatic symptoms of depression (20). Longitudinal epidemiological studies in the general population demonstrate a bi-directional relationship between depression and fatigue, in that depression predicts fatigue and fatigue predicts depression (21). Postpartum depression occurs in 10-16% of women, with depressive symptoms lasting up to 1 year post-delivery (22), underscoring the importance of evaluating the relationship between postpartum depression and fatigue.

Brown and Lumly (23), report a significant association between depressed mood and fatigue at six to seven months post-delivery. Specifically, they found that tiredness was associated with more that a threefold increase in the likelihood of scoring above the cut-off of 13 on the Edinburgh Postnatal Depression Scale (EPDS). They also evaluated whether severity of depressed mood at 6 to 7 months post-delivery would be associated with tiredness/exhaustion at seven to nine months post-delivery. They found a significant linear trend between greater severity of depressed mood and presence of fatigue. Similarly, Troy (24) using a small convenience sample of 68 primiparous women found that at 14 to 19 months postpartum, women who were more depressed reported lower morning energy. As the authors point out, the design of the study does not permit the evaluation of the direction of the relationship between fatigue and depressed mood.

In another study examining correlates of psychological distress in women being admitted to a private mother-baby unit due to infant feeding or settling problems, 91% of the women admitted reported clinically significant levels of fatigue as measured by the fatigue-inertia scale of the POMS (10). The authors also report that 48% of the women scored in the clinical range on the EPDS. While this study underscores the relationship between severe fatigue and psychological distress, the results are of limited generalizability given the population studied, that is, mothers referred to a private mother-baby unit following a diagnosis of infant feeding or

settling problems (10). As in previous studies the design does not allow for the evaluation of the direction of the relationship between fatigue and depressed mood.

Bozoky and Corwin (25) attempted to address the question of directionality by evaluating whether early postpartum fatigue would be predictive of depressed mood at 1 month post-delivery. Using a convenience sample of 38 women, they assessed fatigue levels within 24 hours post-delivery, and again at 7, 21 and 28 days postpartum (insert method of assessment). Depression was assessed at 28 days by the Center for Epidemiological Studies –Depressive Symptomatology Scale (CES-D). Greater levels of fatigue at each time were associated with a greater likelihood of scoring above the cut-off of 11 on the CES-D at day 28. Fourteen women (36.8%) scored in the depressed range. While this study points to a probable relationship between postpartum fatigue and the development of depressed mood, pre-existing depressed mood was not assessed hence the reported association may be confounded by pre-existing depressed mood. The small convenience sample also limits the generalizability of the findings.

In a replication and extension of the study by Bozoky & Corwin (25) fatigue, depression, perceived stress and cortisol concentrations were measured in a sample of 42 women between the 36^{th} and 38^{th} week of pregnancy, at 7 days, 14 and 28 days postpartum (26). Significant correlations between fatigue at each assessment point and depression scores at 28 days were obtained. A greater proportion of the variance in depression was accounted for by assessments of fatigue that were closer in time to the assessment of depression. Similar results were observed for perceived stress with perceived stress seven days following delivery accounting for 57% of the variance in depression scores at day 28. Repeated measure analyses showed a significant time by depression interaction. For women classified as non-depressed, fatigue peaked at the prenatal visit and gradually decreased at each postpartum visit. In contrast, women scoring in the depressed range showed high prenatal fatigue scores and there was no significant decrease in fatigue over time. Despite significant moderate correlations between prenatal and postnatal depression scores ($r = .63$, $p<.0001$ at 14 days; $r = .63$,

p<.001 at 28 days), the authors did not adjust for prenatal depression scores. As well, as in the previous study only a small proportion of women scored as symptomatic for depression (n=11).

Dennis and Ross (27) addressed the potential confound of pre-existing depression by examining the relationship between depression and fatigue in a sample of women scoring <13 on the EPDS at one week postpartum. Depressed mood, infant sleep patterns and maternal fatigue were assessed at four and eight weeks postpartum. At 4 weeks postpartum 42.1 % of mothers reported that they often felt tired or fatigued compared to 36.3 % at 8 weeks postpartum. Logistic regression analyses showed that mothers feeling often fatigued (OR 5.99, p= 0.02), along with "baby cries often" and receiving less than six hours of sleep in a 24-hour period at 4 weeks postpartum, were significantly predictive of an EPDS score >13 at 8 weeks postpartum.

The available evidence suggests that fatigue is heightened by postpartum depressed mood and severe fatigue may be predictive of the development of postpartum depression. Most studies evaluating the relationship between postpartum depressed mood and fatigue have assessed fatigue uni-dimensionally, hence it is unknown if physical or mental dimensions of fatigue are heightened by postpartum depression or whether they differentially predict the onset of postpartum depression. It is noteworthy that in one epidemiological study examining the association of psychological distress and fatigue longitudinally in a primary care sample, patients suffering from both prolonged fatigue and psychological distress were more likely to remain symptomatic at 12 months follow-up, as compared to those reporting psychological distress alone or only fatigue (28).

Stress

Given the sudden increase in demands and life changes associated with the arrival of a baby it is not surprising that stress is heightened in the immediate postpartum (29). Despite the increased stress that can characterize the postpartum period, only a few studies have examined the relationship between stress and fatigue.

In one study, a significant cross-sectional relationship between greater perceived stress and postpartum fatigue and sleepiness was observed at 4 to 6 weeks post delivery (16). One study found no significant associations between family stress as rated by new mothers and fatigue levels. The lack of significant findings may be explained by the low fatigue and stress levels reported by the women in this study (30).

More severe fatigue and greater stress were significantly correlated in another study examining the relationship across the first 9 weeks postpartum (31). Finally, perceived stress shows concurrent and prospective associations with fatigue levels at 7, 14 and 28 days postpartum (26).

While the available evidence suggests a probable relationship between fatigue and stress during the postpartum period the studies are limited by small samples sizes and limited follow-up periods. Consequently, little is known about the relationship between stress and fatigue beyond the first two months postpartum.

Sleep

Sleep disturbances are prevalent in the postpartum. In the first 3 weeks postpartum, new mothers are awakened more frequently during the night and spend considerably more time awake compared to non-postpartum controls assessed over a 3-week period (32). Even at 3 months post-delivery, sleep efficiency is considerably lower compared to pre-pregnancy levels (33).

Interruptions in sleep regardless of the source are associated with increased feelings of fatigue (34, 35), however few studies have directly evaluated this relationship in the postpartum. One study evaluated sleep disturbances assessed through wrist actigraphs (watch shaped devices worn on the non dominant arm assessing motion data) (36). A significant association between morning and evening fatigue at 1 month postpartum and disturbed sleep was demonstrated. Both sleep disruptions and fatigue scores were significantly higher at 1 month postpartum compared to pregnancy levels (36). Others have found that the change in sleep

efficiency between pregnancy and one month postpartum may be more pronounced in primiparous mothers (18).

Although not directly assessing maternal sleep quality, Dennis and Ross (27) found that mothers of infants with poor sleep patterns were more often fatigued compared to mothers who reported better infant sleep patterns during the first 8 weeks postpartum. Similarly, Wambach (31) reports significant correlations between self-reported fatigue and sleep disruptions during the first 9 weeks postpartum in sample of 41 breastfeeding mothers. In another study, fragmented sleep evaluated through polysomnographic assessments was significantly associated with self-reported fatigue at 1 month postpartum (14). These findings extend previous knowledge in that the association between disrupted sleep and fatigue extends to the third month postpartum.

To date none of the studies examining the relationship between sleep and fatigue have evaluated how different dimensions of fatigue are affected by sleep disruptions. Also, while prevalence studies suggest that fatigue persists up until 18 months postpartum, there is no published data on the association between sleep and fatigue beyond three months postpartum.

Impact of postpartum fatigue

While prevalence studies provide some evidence as to the persistence of fatigue in the postpartum, Parks, Lenz, Miligan, and Han (37) directly examined some potential consequences of persistent fatigue on maternal and infant health outcomes. Fatigue was assed at 6 weeks, 3 months, 6 months and 18 months post-delivery. Persistent fatigue was defined as the presence of at least one symptom at all assessment points. Approximately half the sample was persistently fatigued. When scores on mental and physical fatigue were evaluated separately, 11% of the women reported persistent mental fatigue, while 34% reported persistent physical fatigue. When comparing women who were persistently fatigued to those who were not, significant differences were observed on perceived health at 18 months, with persistently fatigue women reporting worse physical health. Persistent mental fatigue

explained a greater, albeit small portion of the variance in worse physical health. There were no statistically significant differences in perceived infant health between the persistently and not persistently fatigued mothers. However, infants' scores on eye-hand coordination and performance developmental levels were significantly higher for infants whose mothers were not persistently fatigued, suggesting that mothers who are not persistently fatigued may be more like to interact with and stimulate their infant. The potential confound of maternal depression was not assessed in this study.

In a study evaluating the effects of postpartum depression on the mother-infant relationship at 3 months postpartum, maternal reports of feeling very tired or exhausted were associated with poorer capacity to take care of the infant or to appreciate the baby's needs. Significant associations were also found between fatigue and poorer scores on corporal interactions, visual interactions and smiling (9). The associations were significant for both maternal rated aspects of the relationship and those rated by trained observers.

In another line of research, one study has evaluated the impact of fatigue and energy levels on maternal functional status. Level of physical energy was one of the strongest correlates of functional status in household, social community and self-care activities at 3 weeks, 6 weeks and 6 months postpartum. The authors of this study conclude that fatigue or low energy may interfere with the rate with which women return to full functional status following childbirth (38). It is noteworthy that by the end of the traditional six-week recovery period less than 30% of the women had reached their desired functional status in household and social activities.

The few studies that evaluate the impact of postpartum fatigue indicate that it may have important consequences on maternal health and functional status and on the quality of attachment between the mother and the infant. More studies are clearly needed to better understand the impact of postpartum fatigue.

Methods for alleviating fatigue

To date only two studies have evaluated interventions to alleviate fatigue in the postpartum. Thome and Adler (39) evaluated the effectiveness of a telephone intervention in alleviating fatigue in a sample of 78 women. Women scoring high on a parent stress index and obtaining a score $\geq$12 on the EPDS were randomly allocated to the intervention or control group. Women in the intervention group received up to five phone calls within a 2-month period. Topics most frequently discussed were fatigue, health problems and role conflict. Most frequently discussed concerns with regards to the infant were sleep problems, crying-fussing, and feeding/digestion problems. Women were offered information and advice as well as empathetic listening. The authors report that the intervention was effective in decreasing fatigue levels , however fatigue and sleep items were combined for the analyses of variance hence it is unclear if the observed effects are due to changes in fatigue, in sleep or both. The intervention was also effective in decreasing depression scores.

In the second study, the effectiveness of a self-care guide describing eight potential sources of fatigue as well as suggestions for its management was evaluated in a sample of 68 primiparous women (40). Women randomly assigned to the experimental group were given a copy of the guide at 1 week postpartum and were instructed to use it whenever they felt tired. A significant reduction in morning fatigue was obtained for the experimental group through the 4^{th} week postpartum, however when the entire 6- week intervention period was evaluated there were no significant group differences. The authors did not assess depressed mood and the longer-term effects of this intervention are not known.

While not assessing fatigue directly, Koltyn and Schultes (41) found that following a 60-minute exercise session women 6 to 20 weeks postpartum reported significantly greater vigor, compared to the control group who rested for the 60-minute period.

A recent review of the epidemiological data on physical activity and feelings of energy and fatigue showed that physical activity was associated with a 40%

reduced risk in experiencing low energy or fatigue. While the reduced risk dropped to 32% when only prospective studies were considered, the reported associations between physical activity, energy and fatigue were consistent across a range of populations (42).

Most controlled exercise interventions to reduce fatigue have targeted medical conditions, predominantly patients with cancer and chronic fatigue. In a meta-analysis of interventions of exercise training, Puetz, O'Connor and Dishman (43) report that exercise alleviates feelings of fatigue and improves energy. It is noteworthy, that the effect obtained with exercise interventions are larger than those obtained with cognitive-behavioural therapy or drug treatments.

Summary and future directions

There is consistent evidence that fatigue during the postpartum is considerably more prevalent compared to general population studies. Paradoxically, fatigue seems to persist or even increase in prevalence as time since delivery elapses. Prevalence studies are limited by the use of single-item assessments of the presence or absence of fatigue, providing little information as to the severity.

Most recent studies in other populations have opted for a multidimensional conceptualization and measurement of fatigue, addressing physical and mental dimensions (e.g., 44, 45). There is limited data on the different dimensions of fatigue during the postpartum. A more complete understanding of how physical and mental dimensions of fatigue are affected by the postpartum context would help tailor future intervention studies and treatment.

While limited, evidence suggests that delivery by caesarean section, presence of depression, elevated stress and poor sleep quality are important contributing factors to postpartum fatigue. Of particular importance is the relationship between fatigue and depressed mood in that preliminary evidence suggests that fatigue may predispose women to postpartum depression. Epidemiological data in the general population suggests that the relationship is bi-directional and depression also predicts persistent fatigue (21). The presence of both fatigue and distress are associated with

poorer prognosis (28). Given the heightened prevalence of both depression and fatigue during the postpartum future studies are needed to further evaluate the relationship between the two.

Preliminary evidence suggests that maternal fatigue may affect the quality of the mother infant relationship, infant developmental tasks, maternal health and functional status. In light of the persistence of fatigue, more studies are needed with extended follow-up periods that would allow for a better understanding of the longer-term impact of persistent postpartum fatigue.

There is considerable evidence that physical activity is associated with reduced fatigue in a variety of other populations. It is therefore surprising that physical activity as a correlate of postpartum fatigue has received no empirical attention. Moreover, exercise is emerging as one of the most effective interventions in alleviating fatigue (43). Randomized controlled trials of exercise during the postpartum would provide some much needed empirically based treatment options for postpartum fatigue.

References

1. Ansara D, Cohen MM, Gallop R, Kun R, Schei B. Predictors of women's physical health problems after childbirth. *J Psychosom Obstet Gynecol* 2005; 26: 115-125.
2. Thompson JF, Roberts CI, Currie M, Ellwood DA. Prevalence and persistence of health problems after childbirth: Association with parity and method of birth. *Birth* 2002; 29: 83-94.
3. McGovern D, Dowd B, Gjerdingen D, Gross CR, Kenney S, Ukestad L, McCaffrey D, Lundberg U. Postpartum health of employed mothers 5 weeks after childbirth. *Ann Fam Med* 2006; 4: 159-167.
4. Brown S, Lumley J. Maternal health after childbirth: Results of an Australian population based survey. *Br J Obstet Gynaecol* 1998; 105, 156-161.
5. Saurel-Cubizolles MJ, Romito P, Lelong N, Ancel PY. Women's health after childbirth: A longitudinal study in France and Italy. *BJOG* 2000; 107: 1202-1209.
6. Cathébras PJ, Robbins JM, Kirmayer L, Haton BC. Fatigue in primary care: Prevalence, psychiatric comorbidity, illness behavior, and outcome. *J Gen Intern Med* 1992; 7: 276-286.
7. Wessely S, Hotof M, Sharp M. Chronic Fatigue and its Syndromes. Oxford England: Oxford University Press, 1998.
8. Torres-Harding S, Jason LA. What is fatigue? History and epidemiology. In J De Luca (Ed), Fatigue as a Window to the Brain. Cambridge Massachusetts: The MIT Press, 2005: 3-17.
9. Righetti-Veltema M, Conne-Perréard E, Bousquet A, Manzano J. Postpartum depression and mother-infant relationship at 3 months old. *J Affect Disord* 2002; 70: 291-306.

10. Fisher JRW, Feekery CJ, Rowe-Murray HJ. Nature, severity and correlates of psychological distress in women admitted to a private mother–baby unit. *J Paediatr Child Health 2002; 38: 140 -145.*

11. Gjendinger DW, Froberg DG, Caholner KM, McGovern, PM. Changes in women's physical health during the first postpartum year. *Arch Fam Med* 1993; 2:277-283.
12. Glazener CMA, Abdalla M, Stroud, P, Naji S, Tempelton A, Russell IT. Postnatal maternal morbidity: Extent causes, prevention and treatment. *Br J Obstet Gynaecol* 1995; 102:282-287.
13. Schytt E, Lindmark G, Waldenstrom U. Physical symptoms after childbirth: Prevalence and associations with self-rated health. *BJOG* 2005; 112:210-217.
14. Lee KA, Zaffke M. Longitudinal changes in fatigue and energy during pregnancy and the postpartum period. *J Obstet Gynecol Neonatal Nurs* 1999; 28: 183-191.
15. Corwin EJ, Bozoky I, Pugh LC, Johnston N. Interleukin-1β elevations during the postpartum period. *Ann Behav Med* 2003; 25: 41-47.
16. Groër M, Davis M, Casey K, Short B, Smith K, Groër S. Neuroendocrine and immune relationships in postpartum fatigue. *MCN: Am J Matern Child Nurs* 2005; 30:133-138.
17. Klimas NG, Fletcher MA, Maher K, Lawrence RBH. Psychoneuroimmunology and fatigue. In J De Luca (Ed), Fatigue as a Window to the Brain. Cambridge Massachusetts: The MIT Press, 2005: 280-298.
18. Waters M, Lee KA. Differences in sleep disturbance and fatigue in nuliparous and multiparous women. *J Nurse Midwifery* 1996; 41: 364-367.
19. Troy NW, Dalgas –Pelish P. The natural evolution of postpartum fatigue among a group of primiparous women. *Clin Nurs Research* 1997;6:126-139

20. Tylee A, Gastpar M, Lepine JP, Mendelwicz J. DEPRES II (Depression Research in European Society II): A patient survey of the symptoms, disability and current management of depression in the community. DEPRES Steering Committee. *Int Clin Psychopharmacol* 1999; 14: 139-151.
21. Addington AM, Gallo JJ, Ford DE, Eaton WW. Epidemiology of unexplained fatigue and major depression in the community: The Baltimore ECA follow-up, 1981-1994. *Psychol Med* 2001; 31: 1037-1044.
22. Cox JL, Murray D, Chapman, G. A controlled study of the onset, duration and prevalence of postnatal depression. *Br J Psychiatry*, 1993;163: 27-31.
23. Brown S, Lumley J. Physical health problems after childbirth and maternal depression at six to seven months postpartum. *BJOG* 2000; 107: 1194-1201.
24. Troy NW. A comparison of fatigue and energy levels at 6 weeks and 14 and 19 months postpartum. *Clin Nurs Research.* 1999; 8: 135-152.
25. Bozoky I, Corwin E. Fatigue as a predictor of postpartum depression. *J Obstet Gynecol Neonatal Nurs* 2002; 31: 436-443.
26. Corwin EJ, Brownstead N, Barton N, Heckard S, Morin K. The impact of fatigue on the development of postpartum depression. *J Obstet Gynecol Neonat Nurs* 2005; 34:577-586.
27. Dennis CL, Ross L. Relationships among infant sleep patterns, maternal fatigue, and development of depressive symptomatology. *Birth* 2005; 32: 187-193.
28. Hickie IB, Koschera A, Hadzi-Pavlovic D, Bennett B, Loyd A. The temporal stability and co-morbidity of prolonged fatigue: A longitudinal study in primary care. *Psychol Med* 1999; 29: 855-861.
29. Miller RL, Pallant JF, Negri LM. Anxiety and stress in the postpartum: Is there more to postnatal distress than depression? *BMC Psychiatry* 2006, 6:12.
30. Gardner DL. Fatigue in postpartum women. *Appl Nurs Res* 1991; 57-62.
31. Wambach KA . Maternal fatigue in breastfeeding primiparae during the first nine weeks postpartum. *J Hum Lact* 1998; 14: 219-229.

32. Swain AM, O'Hara MW, Starr Kr, Gorman LL. A prospective study of sleep, mood, and cognitive function in postpartum and nonpostpartum women. *Obstet Gynecol* 1997; 90:381-386.
33. Lee KA, Zaffke ME, MCEnany G. Parity and sleep during and after pregnancy. *Obstet Gynecol* 2000; 95: 14-18.
34. Martin SE, Wraith PK, Deary IJ, Douglas NJ. The effects of nonvisible sleep fragmentation on daytime function. *Am J Respir Crit Care Med* 1997; 155:1596-1601.
35. Lee KA Sleep and fatigue. *Annu Rev Nurs Res* 2001; 19: 249-273.
36. Gay CL, Lee KA, Lee S-Y. Sleep patterns and fatigue in new mothers and fathers. *Biol Res Nurs* 2004; 5: 311-318.
37. Parks PL, Lenz ER, Milligan RA, Han HR. What happens when fatigue lingers for 18 months after delivery? *J Obstet Gynecol Neonatal Nurs* 1999; 28: 87-93.
38. Tulman L, Fawcett J, Groblewski L, Silverman L. Changes in functional status after childbirth. *Nurs Res* 1990; 39: 70-75.
39. Thome M, Adler B. A Telephone intervention to reduce fatigue and symptom distress in mothers with difficult infants in the community. *J Adv Nurs* 1999; 29: 128-137.
40. Troy NW, Dalgas-Pelish P. The effectiveness of a self-care intervention for the management of postpartum fatigue. *Appl Nurs Res* 2003; 16: 38-45.
41. Koltyn KF, Schultes SS. Psychological effects of an aerobic exercise session and a rest session following pregnancy. *J Sports Med Phys Fitness* 1997; 37: 287-291.
42. Puetz T. Physical activity and feelings of energy and fatigue: epidemiological evidence. *Sports Med* 2006; 36:767-780.
43. Puetz T, O'Connor P, Dishman RK. Effects of chronic exercise on feelings of energy and fatigue: A quantitative synthesis. *Psychol Bull* 2006; 132: 866-876.

44. Oken BS, Kishiyama S, Zajdel D, Bourette D, Carlsen J, Haas M, Hugos C, Kraemer DF, Laurence J, Mass M. Randomized controlled trial of yoga and exercise in multiple sclerosis. *Neurology* 2004; 62: 2058-2064.

45. Berlin AA, Kop WJ, Deuster P. Depressive mood and fatigue after exercise withdrawal: The potential role of decreased fitness. *Psychosom Med* 2006; 68: 224-230.

Table 1. Summary of studies reporting on prevalence, correlates and impact of postpartum fatigue.

Study	N	Sample	Fatigue measure [timing of postpartum measurement]	Correlates
Ansara et al. (1)	200	Women having full-term singelton infant	SI assessing whether fatigue had been problematic since birth [8-10 weeks]	Sociodemographic Maternal/Obstetric Psychosocial History of depression History of violence
Thompson et al. (2)	1295	Women having delivered a live baby.	SI assessing whether fatigue had been problematic [4 days, 8 weeks,16 weeks, 24 weeks]	Postnatal depression Method of delivery
McGovern et al. (3)	716	Employed women having singleton deliveries and intending to return to work after childbirth	SI assessing the presence or absence of fatigue [5 weeks]	Breastfeeding
Brown & Lumley (4)	1336	All women giving birth in a two-week period in September 1997	SI assessing whether fatigue had been problematic since birth [6 -7 months]	Parity Method of delivery

SI= single item, § Postpartum assessment included in this longitudinal study.

Table 1. (continued)

Study	N	Sample	Fatigue measure [timing of postpartum measurement]	Correlates
Gjerdingen et al. (11)	436	All first time mothers	SI assessing presence or absence of fatigue [1, 3, 6 , 9, 12 months]	Method of delivery
Glazner et al (12)	1249	Random sample	SI assessing the presence or absence of fatigue [1 wk, 8wks, 12-18 months]	Parity Method of delivery
Saurel-Cubizolles et al. (5)	1286	All women delivering for the first or second time.	SI assessing fatigue severity "a little" or quit a lot" [5 months, 12 months]	Time elapsed since birth Employment Status Relationship with partner Financial difficulties
Schytt et al. (13)	2450	Radom sample of women attending antenatal clinics	SI assessing fatigue severity "no problem", "minor problem", "severe problem", "very severe problem" [8wks, 12 months]	Parity Self-rated health
Lee & Zaffke (14)	42	Mothers already participating in a longitudinal study with uncomplicated deliveries	Lee Fatigue Scale POMS fatigue/inertia scale Dupuy General Well-Being vitality subscale. [1 month, 3 months[§]]	Parity Changes in laboratory values for progesterone, thyroid function, indicators of iron Sleep architecture

SI= single item,[§] Postpartum assessment included in this longitudinal study

Table 1. (continued)

Study	N	Sample	Fatigue measure [timing of postpartum measurement]	Correlates
Corwin et al. (15)	36	Women with uncomplicated deliveries, not taking any medication at recruitment	Modified Fatigue Symptom checklist (MFSC) (total score) [0, 7, 14 and 28 days]	Depressed mood Anxiety Hemoglobin levels Urine level of proinflammatory cytokines
Groër et al. (16)	119	Women with uncomplicated pregnancies and deliveries.	POMS fatigue/inertia scale [4 to 6 weeks]	Stress Maternal infection symptoms Infant infection symptoms Sleepiness Serum cortisol breast milk prolactin and melatonin concentration
Waters & Lee (18)	31	CS	VAS-Fatigue scale [1 month§]	Parity
Troy & Dalgas-Pelish (19)	36	Primiparous Vaginal deliveries	VAS-Fatigue scale [1-6 weeks]	Demographics Length of labor Infant feeding method

SI= single item, § Postpartum assessment included in this longitudinal study.

Table 1. (Continued)

Study	N	Sample	Fatigue measure [timing of postpartum measurement]	Correlates
Brown & Lumley (23)	1336	All women giving birth in a two-week period in September 1997	SI assessing whether fatigue had been problematic [6 -7 mths, 7-9 mths]	Depressed mood Relationship problems
Troy (24)	49	CS of primiparous women	VAS-Fatigue scale [6 wks,14-19mths]	Sleep Depressed mood
Fisher & Rowe-Murray (10)	109	Mothers admitted to private unit to infant feeding and settling problems	POMS	Quality of relationship with spouse Social Support Personality style
Bozoky & Corwin (25)	38	CS of women having uncomplicated deliveries.	MFSC (total score) [0, 7, 14 and 28 days]	Depressed mood
Corwin et al. (26)	42	CS of women having uncomplicated vaginal singelton deliveries	MFSC (total score) [7, 14 and 28 days]	Depressed mood Stress Salivary cortisol levels

SI= single item, CS= Convenience sample,

Table 1. (Continued)

Study	N	Sample	Fatigue measure [timing of postpartum measurement]	Correlates
Dennis & Ross (27)	505	Women scoring <13 on the Edinburgh postnatal questionnaire	SI assessing fatigue frequency (1=never to 5 =very often) [4 wks, 8 wks]	Depressed mood Infant sleep patterns Maternal sleep
Gardner (30)	35	CS of women with vaginal deliveries	SI assessing fatigue severity [2 days, 2 wks, 6 wks]	Maternal adjustment Depression
Wambach et al. (31)	41	CS	Multidimensional Assessment of Fatigue (global score used as outcome) VAS-Fatigue Scale [3 days, 3 wks, 6 wks, 9 wks]	Labor and delivery Breastfeeding problems Maternal sickness Depressed mood Perceived stress Sleep
Gay et al. (36)	77	Women randomized to the control group of an RCT	VAS-Fatigue scale [1 mth[§]]	Sleep quality

SI= single item, CS= Convenience sample, RCT= Randomized controlled trial.

[§] Postpartum assessment included in this longitudinal study.

Table 1. (Continued)

Study	N	Sample	Fatigue measure [timing of postpartum measurement]	Correlates
Impact				
Parks et al. (37)	229	CS recruited from community hospital	MFSC (mental and physical fatigue severity subscales) (24hrs, 6 weeks, 3, 6 & 18 months)	Infant developmental level Maternal health Infant health
Righetti-Veltema et al. (9)	570	Random sample	SI assessing whether mothers felt "very tired or exhausted" [3 months]	Mother-infant relationship (maternal self-report & observer rated)
Tulman et al. (38)	97	Women with uncomplicated pregnancies	SI assessing perceived energy levels	Demographics Functional Status Infant characteristics Maternal satisfaction with postpartum

SI= single item, CS= Convenience sample

Table 2. Summary of intervention studies included in the review

Study	N	Sample	Fatigue Measure [timing of postpartum measurement]	Other outcomes	Intervention
Thome & Aldler (39)	78	Distressed mothers extracted from a national cohort study and randomly assigned to intervention or control group at 4 to 6 months post-partum	SI measuring severity [pre and post-intervention]	Parental stress Depressed mood Sleep quality [pre and post-intervention]	Telephone information and advice over a 2-month period
Troy & Dalgas-Pelish (40)	68	Primiparous women with vaginal singleton deliveries	VAS-Fatigue Scale [2,3,4,5,6 wks]	NA	A 16-page booklet describing 8 potential sources of fatigue and methods for alleviation

SI= single item

CHAPITRE III

LES EFFETS D'UN PROGRAMME D'EXERCICE À DOMICILE SUR LA FATIGUE CHEZ LES FEMMES DÉPRIMÉES EN POST-PARTUM: RÉSULTATS D'UN ESSAI CLINIQUE RANDOMISÉ

Résumé

Cadre : La fatigue est un symptôme prévalant pendant la période post-partum et qui peut être accentué chez les femmes déprimées.
Objectif : Évaluer l'efficacité d'un programme d'exercice physique fait à la maison dans la réduction des scores de la fatigue physique et mentale chez les femmes en dépression post-partum.
Méthode: Quatre-vingt-huit femmes dans la période post-partum (4-38 semaines) ayant obtenu un score ≥10 sur l'échelle de dépression postnatale d'Edinburgh (EPDS) ont été réparties de façon aléatoire dans le groupe d'intervention (n=46) ou dans le groupe contrôle (n=42). Les femmes du groupe d'intervention ont participé à un programme supervisé d'exercices fait à la maison pendant 12 semaines. Toutes les participantes ont complété le test de condition physique cardiovasculaire à l'entrée dans l'étude. Les résultats (les fatigues physique et mentale) ont été mesurés à l'entrée dans l'étude, en post-traitement et 3 mois post-traitement.
Résultats: Basé sur le principe de l'analyse en intention de traiter, les femmes dans le groupe d'exercice sont comparées aux femmes du groupe contrôle et montrent de façon significative, une plus grande diminution de la fatigue physique en post-traitement [moyenne de changement = -4.07, (IC 95%, (-5.15, -2.98)] et à 3 mois post-traitement [moyenne de changement= -4.24, (IC 95%, (-5.36, -3.12)]. Avec l'exercice, on a observé chez les femmes ayant rapporté peu de fatigue physique à l'entrée dans l'étude, une diminution significative de la fatigue mentale en post-traitement.
Conclusions: Ces résultats montrent que chez les femmes déprimées dans la période post-partum, l'exercice fait à la maison peut réduire les fatigues physique et mentale.

Mots clés: Fatigue physique, fatigue mentale, dépression post-partum, essai clinque randomisé, programme d'exercice physique.

Running Title: EXERCISE TO REDUCE FATIGUE

Effects of a Home-Based Exercise Intervention on Fatigue in Postpartum Depressed Women: Results of a Randomized Controlled Trial

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Abstract

Background: Fatigue is prevalent during the postpartum period and may be heightened in postpartum depressed women.

Purpose: To evaluate the efficacy of a home-based exercise intervention in reducing physical and mental fatigue scores in postpartum depressed women.

Methods: Eighty-eight women in the postpartum (4-38 weeks) obtaining a score ≥10 on the Edinburgh Postnatal Depression Scale (EPDS), were randomly assigned to a 12-week individualized home-based intervention (n=46) or a control group (n=42). All participants completed a cardiovascular fitness test at baseline. Outcomes were physical and mental fatigue scores and were measured at baseline, post-treatment and 3-months post-treatment.

Results: On the basis of intent to treat analyses, compared to the control group, women in the exercise group showed significantly greater reduction in physical fatigue at post –treatment [mean change= -4.07, (95% *CI*, (-5.15, -2.98)] and 3 months post-treatment [mean change= -4.24, (95% *CI*, (-5.36, -3.12)]. Significant reductions in mental fatigue with exercise were observed at post-treatment for women reporting lower physical fatigue at baseline.

Conclusions: Fatigue is a common symptom experienced in the postpartum that can be heightened by depression. The findings show that home-based exercise can reduce physical and mental fatigue in postpartum depressed women.

Introduction

Fatigue is a common symptom experienced during the postpartum (1,2) with up to 67% of women reporting severe fatigue at 12 months post-delivery (2). This rate is considerably higher than those reported in primary care (13.6 %) (3). While maternal fatigue in the postpartum is often considered as a symptom that self-resolves, fatigue levels at 14 and 19 months post-delivery are comparable to those reported at 6 weeks post-delivery (4).

Fatigue is also a common presenting symptom of depression, with reports that up to 73% of depressed patients present with fatigue as a symptom of the disorder (5). Epidemiological studies of fatigued patients show that fatigue and depression co-occur in 17% to 56% of cases (3, 6,7). During the postpartum period, 10 to 16% of women suffer from depression (8). The cumulative burden of postpartum depression and fatigue may adversely affect women's functioning and the mother-infant relationship. Maternal tiredness has been associated with poorer quality of the mother-infant relationship in both depressed and non-depressed mothers (9). Despite the potential negative impact on the mother-infant dyad, there is little empirical knowledge on interventions to alleviate postpartum fatigue.

Among the difficulties in studying fatigue in relation to depression is that it can be manifested through physical and/or mental symptoms. Hence, some may feel physically fatigued but mentally alert, while others may experience mental but not physical fatigue. A multidimensional conceptualization may help elucidate some of the ambiguity surrounding fatigue. Recently developed measures, such as the Multidimensional Fatigue Inventory (MFI-20) (10) allow for the assessment of the various dimensions of fatigue. While it has been suggested that depression and fatigue share underlying mechanisms (11), it has been demonstrated that the constructs are independent and can be measured separately (12-14).

It is noteworthy that in one study examining the association of psychological distress and fatigue longitudinally, patients suffering from both prolonged fatigue and psychological distress were more likely to remain symptomatic at 12 months follow-

up, compared to those reporting psychological distress alone or only fatigue (15). More recently, Dennis and Ross (16) found that new onset of depressive symptoms in the first eight weeks postpartum was strongly associated with maternal fatigue, infant sleep patterns and maternal sleep deprivation, suggesting that fatigue contributes to an increased risk of postpartum depression. Corwin, Brownstead, Barton , Heckard and Morin (17) found that women who reported persistent fatigue in the first 28 days following delivery were more likely to score higher on depression at 28 days postpartum.

To date only two studies have evaluated interventions to alleviate fatigue in the postpartum. Troy and Dalgas –Pelish (18) evaluated the effectiveness of a self-care guide describing eight potential sources of fatigue as well as suggestions for its management in a sample of 68 primiparous women. Women randomly assigned to the experimental group were given a copy of the guide one week following delivery and were instructed to use it whenever they felt tired. A significant reduction in morning fatigue was obtained for the experimental group through the 4^{th} week postpartum, however when the entire 6- week intervention period was evaluated there were no significant group differences. The authors did not assess depressed mood and the longer-term effects of this intervention are not known.

Thome and Adler (19) evaluated the effectiveness of a telephone intervention in alleviating fatigue in a sample of 78 women. Women scoring high on a parent stress index and obtaining a score ≥ 12 on the EPDS were randomly allocated to the intervention or control group. The intervention group received up to five phone calls within a 2-month period. Topics most frequently discussed were fatigue, health problems and role conflict. Women were offered information and advice as well as empathetic listening. The authors report that the intervention was effective in decreasing fatigue levels, however fatigue and sleep items were combined for the analyses of variance hence it is unclear if the observed effects were due to changes in

fatigue, in sleep or both. The intervention was also effective in decreasing depression scores.

An emerging body of literature suggests that exercise in the postpartum period has the potential to promote weight loss (20-22) and improve aerobic fitness and mood (23). To date the impact of exercise on postpartum fatigue has not been evaluated. However, Koltyn and Schultes (24) found that following a 60-minute exercise session women 6 to 20 weeks postpartum reported significantly greater vigor, compared to the control group who rested for the 60-minute period. Studies with female populations have shown exercise to increase vigor and reduce fatigue (25). Most controlled exercise interventions to reduce fatigue have targeted medical conditions, predominantly patients with cancer and chronic fatigue. Using various formats of exercise, these studies show that exercise interventions are effective in reducing fatigue (e.g. 26-30).

The objective of the present study was to evaluate the efficacy of a 12-week home-based exercise intervention in reducing physical and mental fatigue in postpartum depressed women. We expected that compared to the control group, women in the exercise group would show greater reductions in physical and mental fatigue at post-treatment and at 3 months post-treatment.

Methods

This study was part of a randomized trial evaluating the effects of home-based exercise on postpartum depressed mood (PPD) (31).

Participants

Women in the postpartum period (4-38 weeks) experiencing symptoms of postpartum depression were recruited at obstetrician/gynecologists offices and through media advertisement, pamphlets and flyers sent to delivery units of major hospitals in the Montreal area and to community health facilities. Interested participants were screened over the telephone and those obtaining a score ≥10 on the EPDS (32) were invited to participate. Women eligible to participate were able to understand English or French, had no current alcohol or substance abuse, were not currently participating in regular moderate intensity exercise (30 minutes, at least 3 times per week) and had no obstetrical or concomitant diseases which would have precluded participation in an exercise program. This trial was carried out from November 2001 until November 2004. The study was approved by the McGill University Faculty of Medicine Institutional Review Board. All subjects signed informed consent.

Measures

The Multidimensional Fatigue Inventory (MFI-20) (10) is a self-report instrument developed to assess the various components of fatigue. The 20 items generate five subscales comprised of four items each. The subscales are: General Fatigue, Physical Fatigue, Mental Fatigue, Reduced Activity, and Reduced Motivation. Higher scores indicate a higher degree of fatigue (10, 33). The alpha coefficients range from satisfactory to good (α = .76-.88) (10). The alpha coefficient range for the present sample was acceptable to good (α = .64-.85), with the lowest coefficient obtained for the Reduced Motivation subscale. The MFI-20 has been validated with healthy and clinical (e.g. cancer, chronic fatigue syndrome)

populations (10, 33). Moderate correlations with the Beck Depression Inventory indicate that although the concepts measured may be related, they can be measured in distinct ways (14). Changes over time in all subscales were evaluated. The Physical Fatigue and Mental Fatigue subscales were used as outcome measures in the multivariate analyses.

The EPDS is a widely used 10-item scale developed and validated for new mothers to measure depressive symptomology (32). Items inquire about maternal mood in the past seven days and are rated on a 4-point scale. Somatic symptoms likely to occur in the postpartum are not included. A cutoff point of 10 has been shown to have a sensitivity of 84% to 100% and a specificity of 76% to 88% when compared to a diagnosis of minor and major depression using a psychiatric interview such as the Structured Clinical Interview for the DSM-III-R (34-36). This measure was administered during a telephone interview at study entry. Its reliability via telephone administration has been previously demonstrated (35, 37).

The Hamilton Rating Scale for Depression (HAM-D) is a widely used 17-item clinical rating scale assessing depression severity. Its validity has been established in numerous studies (38,39). A trained clinical interviewer administered the HAM-D by telephone at study entry.

A semi-structured telephone interview was developed to inquire about major complications experienced during pregnancy and labor/delivery, demographic information (age, parity, education), and medical history (current and prior medical conditions).

Cardiovascular fitness was measured using a maximal graded exercise stress test on a treadmill. Using a Bruce protocol, the test consisted of increasing workloads of approximately three metabolic equivalents every three minutes until the subject reached volitional exhaustion or any of the the American College of Sports Medicine (ACSM) indicators for stopping an exercise test (40, 41). A 12-lead electrocardiogram measured heart rate and rhythm at rest, continuously during the

test and for 5 minutes during recovery. Blood pressure was measured at rest and every two minutes during exercise and recovery.

Following the initial telephone interview, consenting participants were mailed the questionnaire battery along with a pre-addressed stamped envelope. Women were instructed to complete the questionnaires and return them promptly by mail. Reminder phone calls were made to subjects whose questionnaires had not been received within 2 weeks of mailing. A second pre-treatment telephone interview was scheduled, during which a master's level psychology student administered the HAM-D.

All participants were then referred to a physician supervised cardiovascular fitness test. Baseline fitness was evaluated by time on test and maximal metabolic equivalents (METs). The maximal heart rate from the fitness test was used to determine an individualized exercise target heart rate zone for women assigned to the exercise group. Following the exercise stress test, participants were randomly assigned to either the exercise or the no-treatment control group, using stratification on baseline depression scores (mild: HAMD score < 17 vs ≥ 17 moderate/severe). A blocked randomization procedure was used within each stratum, with block sizes varying from 4 to 6 to minimize group size imbalance. The list was drawn up by a member of the research center not involved in the trial and forwarded to the team statistician for verification. The list was then given to one of the investigators (DD). Allocation of the next subject remained blinded until the moment of randomization.

Questionnaires were mailed to participants in both the exercise group and the control group at post-treatment and 3 months post-treatment. Women were instructed to complete the questionnaires and return them in the pre-addressed stamped envelops via the post.

Exercise Intervention. Participants assigned to the exercise group met four times with the same exercise physiologist during a 12-week training phase. The first visit was approximately 90 minutes and included a review of the cardiovascular fitness test

results, an overview on the benefits of exercise, an individualized exercise prescription, and a supervised exercise session. Principles of warm-up and cool-down, and general exercise precautions were reviewed to minimize the risk of injury. Follow-ups were scheduled at 1, 3, and 9 weeks following the initial visit and consisted of 30-minute in person meetings with the exercise physiologist. The purpose of these meetings was to provide the participants with guidance and support with regards to the exercise program, and to gradually increase the amount and intensity of the exercise.

The exercise prescription was individualized and followed guidelines from the ACSM for developing and maintaining cardiorespiratory fitness (45). These guidelines suggest individuals perform 60-120 minutes/week of aerobic exercise within their target heart rate zone (60-85% of maximal heart rate). Programs were tailored to the individual depending on accessibility to equipment, time constraints, weather and enjoyment of various activities. The intensity of the exercise began at 60-70% of maximal heart rate for all individuals and was gradually increased up to 75-85%, depending on the subject's adaptation to the exercise. Stretching and strength exercises were also prescribed, with the amount of each depending on the subject's needs.

Heart rate monitors were provided to assure proper intensity of training. During the 12-week training phase, participants logged information pertaining to the type of exercise performed (i.e., stretching, cardiovascular), frequency, duration, and heart rate following each exercise session. Participants mailed back the logs to the project-coordinator monthly. Average weekly adherence rates across the 12-week exercise-training phase were calculated as the ratio of the number of exercise sessions reported to the minimum number of sessions prescribed.

Women assigned to the control group completed a questionnaire assessing their exercise participation (type, frequency, duration) once a month during the training phase.

Statistical Analyses

Data were entered and analyzed using SPSS version 12. Descriptive statistics including means, medians, and standard deviations for quantitative variables and proportions for categorical variables were calculated for all baseline variables, and then were used to compare the two groups with respect to baseline values.

A Pearson correlation matrix was computed with all the variables to examine the bivariate correlations between the change from baseline scores for each outcome variable (physical and mental fatigue scores) at each assessment and each potential predictor variable. The pattern of intercorrelations among the possible predictor variables was also examined.

We *a priori* expected that the intervention may have different effects at different assessment points. An intent-to-treat approach was used to test the study hypotheses. To this end, all initially randomized participants were included in the analyses. For participants with missing data at a given assessment point, we imputed the last available value for a given outcome, using the last observation carried forward approach. For patients who did not complete or return their weekly exercise logs we considered that they did not exercise on that given week.

Normality assumptions for outcome variables at each assessment point were met, which justified the use of parametric statistics. For each outcome, analyses focused on the mean change from baseline values at each assessment. Effects of the interventions were initially examined on unadjusted mean change scores using independent sample t-tests. We then developed separate hierarchical multiple linear regression models, equivalent to a one- way ANCOVA, to assess the effects of the intervention on mean changes of physical and mental fatigue at each follow-up assessment, after adjusting for baseline fatigue scores, depression and selected confounders. Variable selection was based on theoretical relevance, pattern of correlation with the outcome variables and other potential predictor variables, and the assumptions underlying multiple regression analysis. Initial models included age,

parity and caesarean delivery in the first step of the equations, however these variables did not contribute to equations and were dropped from the final model.

Finally, we conducted post-hoc analyses to investigate whether the effects of the intervention on the mean change in mental fatigue depended on the baseline values of physical and mental fatigue. This hypothesis was tested by including group by baseline interaction terms. Following recommendations proposed by Aiken and West (46) these terms were entered in the final step of the hierarchical multiple regression models.

We repeated the same analyses comparing the subsample of subjects who adhered to the 12-week exercise intervention (i.e., 60 minutes or more of aerobic exercise per week) to the no-treatment control group at each assessment point.

A total sample size of 90 subjects was determined to ensure 80% statistical power to reject the null hypothesis of no effect of the intervention on the outcome variables.

Results

Figure 1 presents the flow of participants throughout the study. A total of 107 women met study criteria following the telephone screening, 8 failed to mail in the initial questionnaire package and 11 did not complete the baseline stress test. Eighty-eight women were successfully randomized, 46 were assigned to the exercise group and 42 to the control group. During the 12–week training phase adherence to the aerobic exercise component of the program was 76.1% (based on 60 min/week), with an average of 124.09 min/week (*SD* = 96.33). Thirty-five out of the 46 women in the exercise group adhered to the intervention. Women in the control group reported an average of 54.6 min/week *(SD=55.8)* of aerobic exercise during the 12-week period.

[Insert Figure 1]

Participants who completed all assessments points (n = 62, 70%) were not different from those with missing data (n = 26, 29.5 %).

At the baseline assessment participants assigned to each group were similar on most characteristics (see Table 1), except that in the exercise group, there was a greater proportion of primiparous women, as well as more women having delivered by caesarean section, however these differences did not attain statistical significance (χ^2 (1, N = 88) = 0.60, p = .44 ; χ^2 (1, N = 88) = 1.38, p = .24 , respectively). Moreover, mental fatigue scores were higher in the exercise group (t (86) = 2.12, p = .04, two-tailed). To avoid the risk of confounding the between-group comparisons by this imbalance, all multivariate analyses were adjusted for baseline mental fatigue scores.

[Insert Table 1 and Table 2]

Table 2 compares the unadjusted change between baseline and each post-treatment assessment point for each MFI-20 subscale. At post-treatment, the mean decrease in physical fatigue was significantly greater in the exercise group compared to the control group. The difference was maintained at 3 months post-treatment. At post-treatment, there was a greater decrease in mental fatigue scores for the exercise group compared to the control group, however the difference did not reach statistical significance. The mean decrease in mental fatigue scores between the groups became marginally significant at 3 months post-treatment. At post-treatment, significantly greater decreases with exercise were obtained for the General Fatigue, Reduced Activity and Reduced Motivation subscales of the MFI. The significant difference for the Reduced Motivation subscale was maintained at 3 months post-treatment.

In the unadjusted comparisons with the subsample of women who adhered to the intervention the differences were overall greater. The change in mental fatigue scores did not attain statistical significance at post-treatment, however the change from baseline was significantly greater in the exercise group at 3 months post-treatment (results not shown).

Table 3 shows the adjusted between group difference on mean changes from baseline with 95% *CI*. The regression models for both physical and mental fatigue were adjusted for: weeks since delivery, METS at baseline stress test, baseline EPDS,

and baseline physical and mental fatigue scores. The first two columns show the mean change in the exercise group as compared to the control group in the intent-to-treat analyses and the last two show the results for the efficacy analyses. Following adjustments, there was a significantly greater decrease in physical fatigue scores in the exercise group at post-treatment (β = .26, p= .01; $F(6,81)$ = 4.55 , p =.001, R^2 = .25). The difference between the two groups was only marginally significant at 3 months post-treatment (β = .18, p= .088; $F(6,81)$= 4.63, p =.001, R^2 = .26). When comparing the subsample of adherers to the control group the differences were greater, with statistically significant differences at both post-treatment (β = .36, p = .001; $F(6,70)$= 6.13, p < .001, R^2 = .34) and 3 months post-treatment (β = .36, p<.0001; $F(6,70)$ = 7.85, p<.001, R^2 = .40). The effect sizes for the intent-to-treat analyses calculated using Cohen's d (47) were 0.58 (*95% CI,* 0.16, 1.01) at post-treatment and 0.38 (*95% CI* , -0.04, 0.80) at 3 months post-treatment.

[Insert Table 3]

After controlling for baseline fatigue scores, depression, number of weeks elapsed since delivery and baseline cardiorespiratory fitness (METS), there were no significant differences in changes in mental fatigue between the two groups. Analyses with the subsample of adherers showed marginally significant group differences at 3 months post-treatment (β = .71 , p =. 08; $F(7,69)$ = 5.27, p < .001, R^2 = .28).

Ancillary Analyses

The absence of a significant direct effect of the intervention on mental fatigue is consistent with previous exercise trials (27, 48). However, fatigue severity has been shown to affect adherence to exercise regimens (49) and consequently, may moderate the effect of an exercise intervention. To assess whether the effects of the intervention on changes in mental fatigue scores depended on baseline levels of physical and mental fatigue, we tested group-by baseline interactions in the third step of each regression model. At post-treatment the group-by baseline physical fatigue interaction was a significant independent predictor of change in mental fatigue (β =-

.67 , $p < .05$; $F(7,80) = 4.33$, $p < .0001$, $R^2 = .28$). At 3 months post-treatment a statistical trend was observed for the group by baseline mental fatigue interaction term ($\beta = .54$, $p = .10$; $F(7,80) = 4.13$, $p < .0001$ $R^2 = .27$). In the analyses including only adherers, a statistical trend was observed for the group by baseline mental fatigue interaction term at post-treatment ($\beta = .67$, $p = .063$; $F(7,69) = 4.40$, $p < .0001$, $R^2 = .31$). At 3 months post-treatment the group-by baseline mental fatigue interaction was a significant independent predictor of change in mental fatigue ($\beta = .71$, $p < 05$; $F(7,69) = 5.27$, $p < .0001$, $R^2 = .35$).

[Insert Table 4]

Table 4 presents the adjusted mean change scores in mental fatigue as a function of baseline physical and mental fatigue. At post-treatment, the simple slope analysis for the interaction effect between baseline physical fatigue by group showed that exercise produced greater reductions in mental fatigue scores for those reporting lower physical fatigue at baseline ($\beta = -.43$, $p < .05$). The simple slope analyses for the interaction effects between baseline mental fatigue scores and group showed a greater reduction in mental fatigue with exercise at 3 months post-treatment for women reporting higher baseline mental fatigue ($\beta = -.92$, $p = .007$).

Discussion

This is the first randomized trial with a postpartum depressed sample to examine the effects of exercise on fatigue. We found that a 12 –week home-based exercise program was effective in decreasing physical fatigue for postpartum depressed women. The intervention was also effective in alleviating mental fatigue for women reporting lower physical fatigue and greater mental fatigue at study entry.

At post-treatment our unadjusted analyses showed significantly greater decreases on all MFI –20 subscales for the intervention group compared to the control group, with the exception of Mental Fatigue. This is consistent with previous studies reporting significant overall decreases in fatigue with exercise in medical patient

populations (26-30, 45), as well as community studies with female participants (25, 46).

Few exercise studies have assessed fatigue using multidimensional measures such as the MFI-20. In a randomized controlled trial of exercise and yoga with Multiple Sclerosis patients, Oken et al. (45) obtained significant decreases on the General Fatigue subscale of the MFI-20 with exercise, however the changes on the other subscales did not reach statistical significance. Fulcher and White (27) report a reduction in physical but not mental fatigue with exercise in patients with chronic fatigue. Finally, a slight improvement in Reduced Activity, Reduced Motivation, and Mental Fatigue with exercise was found in a small sample of advanced cancer patients (47). Our study extends the benefits of exercise on various dimensions of fatigue to postpartum depressed women.

To our knowledge only two studies have evaluated the efficacy of home-based exercise in alleviating fatigue (29, 48). These studies targeted fatigue in populations that may present barriers to exercising in a gym or in having to attend scheduled exercise classes. In the first study, home-based exercise was effective in decreasing fatigue in breast cancer patients (29). Mock et al. (48) did not obtain significant group differences due to treatment dilution (i.e., a significant portion of the control group exercised), however they found a significant overall effect of exercise on reduced fatigue levels in a group of sedentary breast cancer patients receiving outpatient adjuvant chemotherapy or radiation therapy. A home-based format may help decrease common exercise barriers in the postpartum such as transportation and arranging for childcare during exercise sessions outside the home. These barriers may be aggravated by the combined burden of fatigue and postpartum depression.

After controlling for depression scores, time elapsed since the delivery, fitness level, and baseline fatigue, we found that home-based exercise can alleviate physical fatigue in postpartum depressed women. Conventional wisdom would suggest that rest rather than physical exercise may be an effective remedy for fatigue in the postpartum, however prolonged bed rest in addition to increase in body weight may

in fact contribute to fatigue (49,50). Recently Dennis and Ross (16) found that fatigue in the postpartum was unrelated to daytime rest providing further support for targeting fatigue in the postpartum with interventions other than rest.

The intervention was effective in alleviating mental fatigue for women reporting lower baseline physical fatigue scores, but the finding was only marginally significant at the 3 months post-treatment. Those with lower physical fatigue scores may have been more likely to participate in exercise activities due to less physical fatigue.

The adjusted analyses on the subsample of adheres showed that the intervention was effective in reducing mental fatigue scores for women who reported higher levels of mental fatigue at baseline. The Mental Fatigue subscale of the MFI-20 assesses difficulties in concentration, directing attention, or staying focused. The forms of exercise most often reported by the women in our study (e.g., walking for exercise, jogging), require little focused attention and may provide distraction from usual thoughts and concerns, making it more appealing to women experiencing greater mental fatigue. Reducing mental fatigue and optimizing women's attention and cognitive functioning is especially pertinent in the postpartum due to increased demands and little opportunity for restorative activities (51).

In addition to evidence that fatigue may be a risk factor for prolonged depression (15) or new onset of depression in the postpartum (16), fatigue is often a treatment resistant symptom of depression and may increase the risk of relapse (52). Given the prolonged nature of fatigue in the postpartum, further studies are needed to determine whether alleviating physical or mental fatigue with exercise decreases the risk of relapse in postpartum depressed women.

Study limitations

Participants in our study were highly educated and volunteered to participate in a home-based exercise program, these results may not be generalizable to populations with different demographics characteristics. The possible effects of reduced fatigue on the daily physical activities of mothering (carrying, lifting or

running after baby) or the ability to resume previous levels of activity were not assessed. However, women in the intervention arm of the study did report a greater decrease on the Reduced Activity subscale of the MFI-20. Future studies are needed to clarify the impact of exercise on daily physical activities of mothering.

The differences observed in this study may be attributable to the exercise therapist's attention and/or women's expectations that they would benefit from the exercise intervention. Exercise studies in non-depressed populations with attention-placebo conditions show that the amount of therapist attention was not responsible for the observed reduction in general and physical fatigue (27, 29). However, a recent review of studies examining patient-therapist relationship concluded that patient expectancies are related to improvements in many clinical trials, although the authors note that several of the studies reviewed were not randomized (53).

Clinical Implications

Home-based exercise is a low cost and easily implemented intervention that can reduce fatigue in postpartum depressed women. Targeting fatigue may help decrease the risk of residual symptoms of depression that can lead to a recurrence of a depressive episode with the documented negative impacts on the mother and the infant (9, 54).

References

1. McGovern D, Dowd B, Gjerdingen D, Gross CR, Kenney S, Ukestad L, McCaffrey D, Lundberg U. Postpartum health of employed mothers 5 weeks after childbirth. *Annals of Family Medicine*. 2006, *4*: 159-167.
2. Saurel-Cubizolles MJ, Romito P, Lelong N, Ancel PY. Women's health after childbirth: A longitudinal study in France and Italy. *British Journal of Obstetrics and Gynaecology*. 2000, *107*: 1202-1209.
3. Cathébras PJ, Robbins JM, Kirmayer L, Haton, BC. Fatigue in primary care: Prevalence, psychiatric comorbidity, illness behavior, and outcome. *Journal of General Internal Medicine*. 1992, *7*: 276-286.
4. Troy NW. A comparison of fatigue and energy levels at 6 weeks and 14 and 19 months postpartum. *Clinical Nursing Research*. 1999, *8*: 135-152.
5. Tylee A, Gastpar M, Lepine JP, Mendelwicz J. DEPRES II (Depression Research in European Society II): A patient survey of the symptoms, disability and current management of depression in the community. DEPRES Steering Committee. *International Clinical Psychopharmacology*. 1999, *14*: 139-151.
6. Kroenke K, Wood DR, Mangelsdorff AD, Meier NJ, Powell JB. Chronic fatigue in primary care: Prevalence, patient characteristics and outcome. *Journal of the American Medical Association*. 1988, *260*: 929-934.
7. Manu P, Lane TJ, Matthews DA. The frequency of chronic fatigue syndrome in patients with symptoms of persistent fatigue. *Archives of Internal Medicine*. 1988, *109*: 554-556.
8. Stowe ZN, Nemeroff CB. Women at risk for postpartum-onset major depression. *American Journal Obstetrics Gynecology*. 1995,173:639-645.
9. Righetti-Veltema M, Conne-Perréard E, Bousquet A, Manzano J. Postpartum depression and mother-infant relationship at 3 months old. *Journal of Affective Disorders*. 2002, *70*: 291-306.

10. Smets EMA, Garssen B, Bonke B, de Haes JC. The Multidimensional Fatigue Inventory (MFI): Psychometrics qualities of an instrument to assess fatigue. *Journal of Psychosomatic Research*. 1995, *39*: 315-325.
11. Mohr DC, Hart SL, Goldenberg A. Effects of treatment for depression on fatigue in multiple sclerosis. *Psychosomatic Medicine*. 2003, *65*: 542-547.
12. Kirk KM, Hickie IB, Martin NG. Fatigue as related to anxiety and depression in a community-based sample of twins aged over 50. *Social Psychiatry and Psychiatric Epidemiology*. 1999, *34*: 85-90.
13. Koschera A, Hickie I, Hadzi-Pavlovic D, Wilson A, Loyd A. Prolonged fatigue, anxiety and depression: Exploring relationships in a primary care sample. *Australian and New Zealand Journal of Psychiatry*. 1999, *33*: 545-552.
14. Schneider RA. Concurrent validity of the Beck depression inventory and the Multidimensional Fatigue Inventory-20 in assessing fatigue among cancer patients. *Psychological Reports*, 1998, *82*: 883-886.
15. Hickie IB, Koschera A, Hadzi-Pavlovic D, Bennett B, Loyd A. The temporal stability and co-morbidity of prolonged fatigue: A longitudinal study in primary care. *Psychological Medicine*. 1999, *29*: 855-861.
16. Dennis CL, Ross L. Relationships among infant sleep patterns, maternal fatigue, and development of depressive symptomatology. *Birth.* 2005, *32,* 187-193.
17. Corwin EJ, Brownstead J, Barton N, Heckard S, Morin K. The impact of fatigue on the development of postpartum depression. *Journal of Obstetrics Gynecolgy & Neonatal Nursing*. 2005, *34*: 577-586.
18. Troy NW, Dalgas-Pelish P. The effectiveness of a self-care intervention for the management of postpartum fatigue. *Applied Nursing Research*. 2003, *16*, 38-45.

19. Thome M, Adler B. A Telephone intervention to reduce fatigue and symptom distress in mothers with difficult infants in the community. *Journal of Advanced Nursing*. 1999, *29* : 128-137.

20. Leermakers EA, Anglin K, Wing RR. Reducing postpartum weight retention through a correspondence intervention. *International Journal of Obesity and Related Metabolic Disorders*. 1998, *22*:1103-1109.

21. Ohlin A, Rossner S. Factors related to body weight changes during and after pregnancy: The Stockholm Pregnancy and Weight Development Study. *Obesity Research*. 1996, *4*:271-276.

22. Harris HE, Ellison GT, Clement S. Do the psychosocial and behavioural changes that accompany motherhood influence the impact of pregnancy on long-term weight gain? *Journal of Psychosomatic Obstetrics & Gynaecology*. 1999, *20*:65-79.

23. Larson-Meyer D-E. Effect of postpartum exercise on mothers and their offspring: A review of the literature. *Obesity Research*. 2002, *10*:841-853

24. Koltyn KF, Schultes SS. Psychological effects of an aerobic exercise session and a rest session following pregnancy. *Journal of Sports Medicine & Physical Fitness*. 1997, *37*: 287-291.

25. Annesi JJ. Relation of rated fatigue and changes in energy after exercise and over 14 weeks in previously sedentary exercisers. *Perceptual and Motor Skills*. 2002, *95,* 719-727.

26. Dimeo FC, Stieglitz RD, Noveli-Fischer U, Fetscher S, Keul J. Effects of physical activity on the fatigue and psychologic status of cancer patients during chemotherapy. *Cancer*. 1999, *85*: 2273-2277.

27. Fulcher KY, White PD. Randomised controlled trial of graded exercise in patients with the chronic fatigue syndrome. *British Medical Journal*. 1997, 314: 1647-1652.

28. Mock V, Hassey-Dow K, Meares CJ, Grimm PM, Dienemann JA, Haisfield-Wolfe ME, Quitasol W, Mitchell S, Chakravarthy A, Gage I. Effects of

exercise on fatigue, physical functioning, and emotional distress during radiation therapy for breast cancer. *Oncology Nursing Forum*. 1997, 24: 991-1000.

29. Pinto B, Frierson GM, Rabin C, Trunzo JJ, Marcus BH. Home-based physical activity intervention for breast cancer patients. *Journal of Clinical Oncology*. 2005, *23*: 3577-3587.
30. Puetz T, O'Connor P, Dishman RK. Effects of chronic exercise on feelings of energy and fatigue: A quantitative synthesis. *Psychological Bulletin*. 2006, *132*: 866-876.
31. Da Costa D, Lowensteyn I, Abrahamowicz M, Ionescu-Ittu R, Dritsa M, Rippen, N, Cervantes P, Khalifé S. A Randomized Clinical Trial of Exercise to Alleviate Postpartum Depression. Manuscript Submitted.

32. Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression: Development of the 10-item Edinburgh postnatal depression scale. *British Journal of Psychiatry*. 1987, *150*: 782-786.
33. Smets EM, Garssen B, Cull A, de Haes JC. Application of the multidimensional fatigue inventory (MFI-20) in cancer patients receiving radiotherapy. *British Journal of Cancer*. 1996, 73: 241-245.
34. Harris B, Huckle P, Thomas R, Johns S, Fung H. The use of rating scales to identify post-natal depression. *British Journal of Psychiatry*. 1989, *154*, 813-817.
35. Murray L, Carothers AD. The validation of the Edinburgh Post-natal Depression Scale on a community sample. *British Journal of Psychiatry*. 1990: *157*, 288-290.
36. Zelkowitz P, Milet TH. Screening for postpartum depression: A community sample. *Canadian Journal of Psychiatry*. 1995, *40*: 80-86.
37. Da Costa D, Larouche J, Dritsa M, Brender W. Psychosocial correlated of prepartum and postpartum depressed mood. *Journal of Affective Disorders*. 2000, 59: 31-40.
38. Hamilton MA. Development of a rating scale for primary depressive illness. *British Journal Social Clinical Psychology*. 1967, *6*:278-296.
39. Hamilton MA. The Hamilton Rating Scale for Depression. In: Sortorius N, Ban TA, eds. *Assessment of Depression*. Berlin: Springer-Verlag; 1986:143-152.
40. Bruce RA, Kusumi F, Hosmer D. Maximal oxygen uptake and nomographic assessment of functional aerobic impairment in cardiovascular disease. *American Heart Journal*. 1973, *85*: 546-562.
41. *American College of Sports Medicine. American College of Sports Medicine's guidelines for exercise testing and prescription* (5th ed.). Philadelphia: Williams & Wilkins, 1995.

42. American College of Sports Medicine American College of Sports Medicine Position Stand. The recommended quantity and quality of exercise for developing and maintaining cardiorespiratory and muscular fitness, and flexibility in healthy adults. *Medicine and Science in Sports Exercise*. 1998, *30*: 975-91.

43. Aiken LS, West SG. *Multiple Regression: Testing and interpreting interactions*. Thousand Oaks: Sage, 1991.

44. Cohen J. *Statistical Power Analysis for the Behavioral Sciences*. 2nd ed. Hillsdale, NJ: Elbraum.

45. Oken BS, Kishiyama S, Zajdel D, Bourette D, Carlsen J, Haas M, Hugos C, Kraemer DF, Laurence J, Mass M. Randomized controlled trial of yoga and exercise in multiple sclerosis. *Neurology*. 2004: *62*, 2058-2064.

46. Annesi JJ. Mood alterations following an indoor and outdoor exercise program in healthy elderly women. *Perceptual and Motors Skills*. 2005,*100*:707-715.

47. Porock D, Kristjanson LJ, Tinnelly K, Duke T, Blight J. An exercise intervention for advanced cancer patients experiencing fatigue: a pilot study. *Journal of Palliative Care*. 2000, *16*: 30-36.

48. Mock V, Frangakis C, Davidson NE, Ropka MC, Pickett M, Poniatowski B, Stewart, KJ, Cameron L, Zawaki K, Podewils LJ, Cohen G, McCorkel R. Exercise manages fatigue during breast cancer treatment: A randomized controlled trial. *Psychooncology*. 2005, *14*: 464-477.

49. Lim W, Hong S, Nelesen R, Dimsdale JE. The association of obesity, cytokine levels, and depressive symptoms with diverse measures of fatigue in healthy subjects. *Archives of Internal Medicine*. 2005, *25*: 910-915.

50. Maloni JA, Park S. Postpartum symptoms after antepartum bed rest. *Journal of Obstetrics Gynecology & Neonatal Nursing*. 2005, *34*:163-171.

51. Stark MA , Cimprich B. Promoting attentional health: Importance to women's lives. *Health Care for Women International*. 2003, *24*: 93-102.

52. Marin H & Menza MA. The management of fatigue in depressed patients. *Essential Psychopharmacology*. 2005, 6:15-192.
53. Hrobjartsson, A. What are the main methodological problems in the estimation of placebo effects? *Journal of Clinical Epidemiology*. 2002, 55: 430-435.
54. Murray L, Cooper P eds. *Postpartum Depression and Child Development*. The Guilford Press. London, 1997.

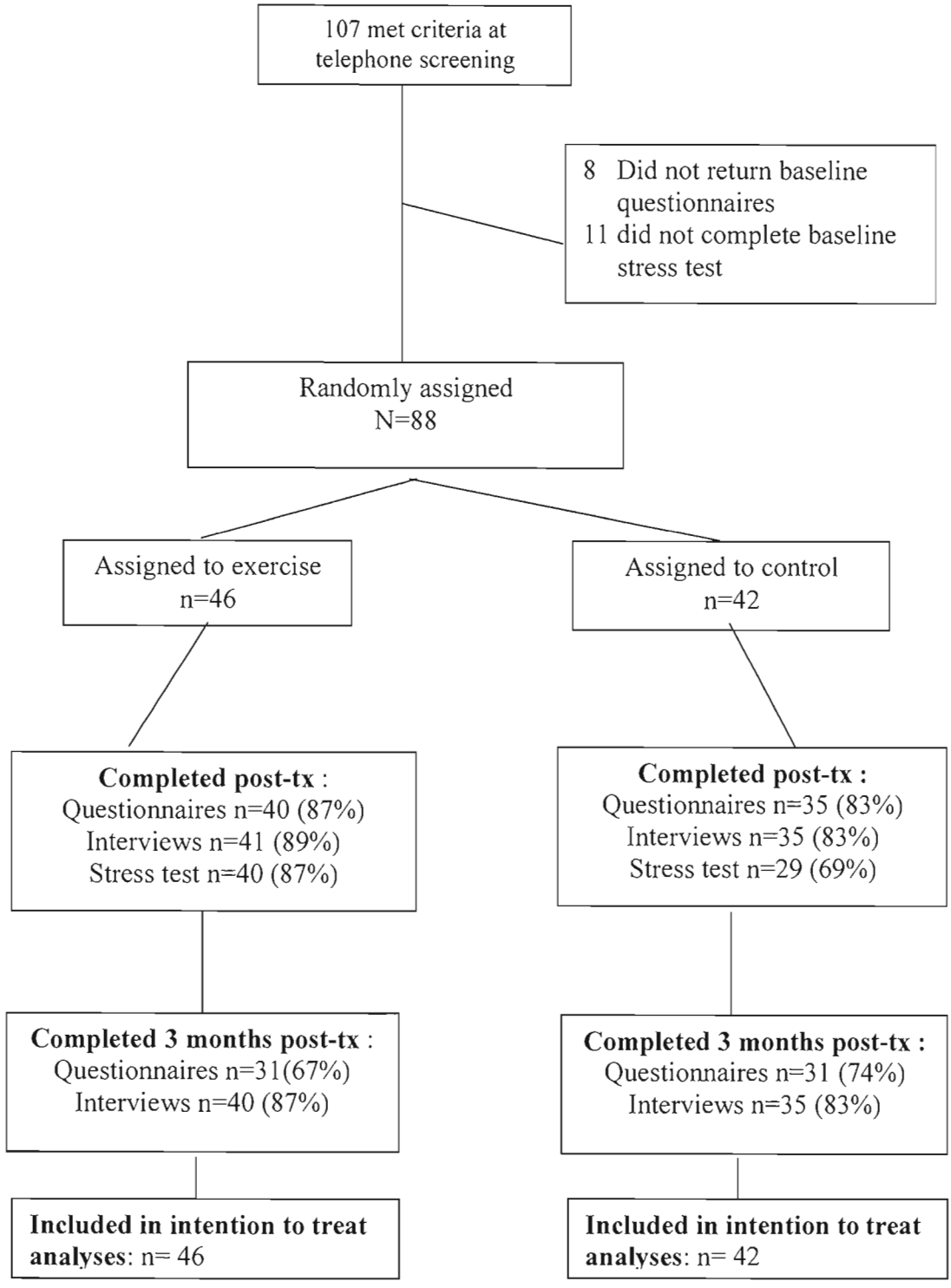

Figure 1. *Participation flow*

Table 1.

Patient Characteristics at Study Entry

	Exercise (n= 46) *Mean (SD)*	Control (n= 42) *Mean (SD)*
Age (years)	34.33 (3.36)	32.67 (3.36)
Education (years)	16.04 (1.71)	15.10 (2.22)
Income*	5.25 (1.27)	4.90 (1.71)
Years with current partner	7.30 (4.02)	6.15 (3.62)
Primiparous	41.3%	33.3%
Cesarean Delivery	32.6%	21.4%
Weeks since delivery	10.96 (7.22)	12.09 (8.08)
Body Mass Index	27.08 (5.67)	26.43 (4.92)
METS at stress test	10.69 (1.72)	11.01 (1.66)
Depression measures		
EPDS	13.63 (3.62)	13.57 (3.90)
HAM-D	12.1 (4.2)	11.1 (3.8)
MFI Subscales		
Physical Fatigue	14.70 (3.23)	13.55 (4.25)
Mental Fatigue	14.52 (4.00)	12.60 (4.54)
General Fatigue	16.63 (2.89)	15.36 (4.02)
Reduced Motivation	11.87 (3.42)	10.07 (3.37)
Reduced Activity	13.59 (4.20)	11.69 (4.65)

Note: * Income scale 1-6 e.g., 4=$30,000-$40,000; 5=$40, 000-$50,000. EPDS= Edinburgh Postnatal Depression Scale, HAM-D= Hamilton Rating Scale for Depression.

Table 2.

MFI Subscales Mean Change Scores From Baseline at Each Assessment Point.

	Post-Treatment			3 Months Post-Treatment		
	Exercise Mean (95% *CI*).	Control Mean (95% *CI*).	p^a	Exercise Mean (95% *CI*).	Control Mean (95% *CI*).	p^a
Physical Fatigue	-4.07 (-5.15, -2.98)	-1.40 (-2.54, -0.27)	.001	-4.24 (-5.36, -3.12)	-2.38 (-3.55, -1.21)	.025
Mental Fatigue	-3.02 (-4.38, -1.67)	-1.88 (-3.3, -0.47)	.250	-3.39 (-4.7, -2.11)	-1.71 (-3.05,-0.38)	.075
General Fatigue	-3.87 (-5.00, -2.74)	-1.83 (-3.02, -0.65)	.016	-4.07 (-5.20,-2.94)	-2.57 (-3.75, -1.39)	.073
Reduced Activity	-4.02 (-5.24, -2.80)	-1.86 (-3.19, -0.59)	.016	-4.35 (-5.72, -2.98)	-2.64 (-4.07, -1.21)	.090
Reduced Motivation	-2.96 (-4.11, -1.81)	-0.88 (-2.08, 0.32)	.015	-3.02 (-4.20, -1.84)	-0.98 (-2.21, 0.26)	.019

Note: [a] Independent-group t-tests of the difference in the mean change from baseline in the two groups.

Table 3.

Effects of the Intervention on the Adjusted Mean Change in Mental and Physical Fatigue Scores at Each Assessment Point

	Intent-to-Treat Analyses		Efficacy Analyses	
Outcome	Post-Treatment	3-Months Post-Treatment	Post-Treatment[#]	3 Months Post-Treatment[#]
Physical Fatigue	-2.03 (-3.59, -0.48)	-1.45 (-3.0, 0.97)	-2.93 (-4.59,-1.28)	-2.81 (-4.32,-1.31)
Mental Fatigue	-0.51 (-2.36, 1.35)	-1.04 (-2.81, 0.74)	-0.80 (-2.85, 1.25)	-1.84 (-3.74, .007)

Note: Between group difference on mean change scores (95% CI). Reference: non-intervention control group.

[#] Analysis restricted to subjects in the intervention group who exercised at least 1h/ week (n = 35); Reference: non-intervention control group

Table 4.

Adjusted Mean Changes in Mental Fatigue Depending on Baseline Mental and Physical Fatigue Scores

	Baseline to Post-Treatment		Baseline to 3 Months Post-Treatment	
	Exercise	Control	Exercise	Control
	Mean change (95% CI)	*Mean change (95% CI)*	*Mean change (95% CI)*	*Mean change (95% CI)*
Mental Fatigue§				
< 14 (n=39)	-3.83 (-6.18,-1.47)	-3.81 (-6.51, -1.12)	-2.74 (-5.01,-0.46)	-2.34 (-4.94, 0.26)
≥ 14 (n=49)	-1.62 (-3.78, 0.54)	-1.13 (-3.28, 1.01)	-3.30 (-5.39,-1.22)	-1.76 (-3.83, 0.31)
Physical Fatigue§				
< 15 (n=41)	-3.47 (-5.64,-1.29)	-1.68 (-4.08, 0.73)	-3.66 (-5.97,-1.57)	-2.16 (-4.48, 0.15)
≥15 (n=47)	-2.18 (-4.13, -0.23)	-2.82 (-5.12,-0.53)	-2.62 (-4.50, -0.75)	-1.99 (-4.20, 0.21)

Note : Models adjusted for time elapsed since the delivery, baseline depression scores (EPDS), baseline cardiorespiratory fitness, and baseline physical and mental fatigue scores. §Groupings based on median split

CHAPITRE IV

LES EFFETS D'UN PROGRAMME SUPERVISÉ D'EXERCICE À DOMICILE SUR LA FATIGUE CHEZ LES FEMMES DÉPRIMÉES EN POSTPARTUM : POUR QUI EST-CE BÉNÉFIQUE ET POURQUOI?

Résumé

Objectifs : 1) Explorer les variables modératrices de l'effet des exercices physiques fait à la maison sur la diminution des scores de la fatigue physique et mentale chez les femmes déprimées en post-partum et 2) Explorer les variables médiatrices de l'action des exercices supervisés faits à la maison sur le changement de la fatigue physique.
Méthodes : Quatre-vingt-huit femmes dans la période post-partum (4-38 semaines) ayant obtenu un score ≥10 sur l'échelle de dépression postnatale d'Edinburgh (EPDS) ont été réparties de façon aléatoire dans le groupe d'exercice à domicile de 12 semaines (n=46) ou dans le groupe contrôle (n=42). Les analyses de cet article comparent les 35 femmes qui ont été assidues dans le groupe d'intervention et le groupe contrôle (n=42). Toutes les participantes ont complété le test de condition physique à l'entrée dans l'étude et au post-traitement. Les participantes ont complété une série de questionnaires mesurant les résultats (fatigues physique et mentale) de même que les variables modératrices et médiatrices potentielles à l'entrée dans l'étude et au post-traitement.
Résultats : Les régressions linéaires hiérarchiques évaluant l'interaction de l'intervention et des modérateurs potentiels du changement de la fatigue physique ont montré une tendance statistique en ce qui concerne le nombre de semaines qui se sont écoulées depuis l'accouchement ($p = .066$), et la condition cardiovasculaire à l'entrée dans l'étude ($p = .078$). Les régressions linéaires hiérarchiques évaluant les modérateurs de l'intervention sur la fatigue mentale ont montré que l'intervention est efficace pour les femmes qui sont entrées dans l'étude à une période post-partum plus tardive ($p=.001$) et pour les femmes avec des scores de dépression élevés ($p= .014$). La diminution de la fatigue physique grâce à l'exercice est partiellement expliquée par la diminution du stress perçu et par l'augmentation de la dépense énergétique reliée à l'exercice.

Mots clés : Exercice physique, dépression postpartum, fatigue physique, fatigue mentale

Running Title: MODERATORS AND MEDIATORS OF HOME-BASED EXERCISE

Effects of Supervised Home-Based Exercise on Fatigue in Postpartum Depressed Women: Who is More Likely to Benefit and Why?

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Abstract

Objectives : 1) To explore moderators of the effects of home-based exercise on reductions in physical and mental fatigue scores in postpartum depressed women and 2) To explore mediators of the intervention on changes in physical fatigue. ***Method:*** Eighty-eight women in the postpartum (4-38 weeks) obtaining a score ≥10 on the Edinburgh Postnatal Depression Scale (EPDS), were randomly assigned to a 12-week individualized home-based exercise intervention (n = 46) or a control group (n = 42). The present analyses include the 35 women who adhered to the intervention and the control group. Participants completed a cardiovascular fitness test, and a battery of questionnaires assessing the outcomes (Physical and Mental Fatigue) as well as potential moderators and mediators at baseline and post-treatment. ***Results:*** Hierarchical linear regressions evaluating moderators of change in physical fatigue with exercise showed statistical trends for number of weeks elapsed since delivery (p = .066) and physical fitness at study entry (p = .078). Analyses of moderators of changes in mental fatigue with exercise showed that the intervention was effective for women entering the study later in the postpartum period (p = .001), and women with higher depression scores (p = .014). Reductions in physical fatigue with exercise were partially mediated by reductions in perceived stress and increased exercise related energy expenditure.

Keywords: Exercise, postpartum depression, physical fatigue, mental fatigue.

While maternal fatigue in the postpartum is often considered as a symptom that self-resolves, up to 67% of women report severe fatigue at 12 months post-delivery (Saurel-Cubizolles et al., 2000). Emerging evidence suggests that fatigue is associated with onset of postpartum depressive symptomatology (Corwin et al., 2005; Dennis & Ross, 2005). Moreover, fatigue in depressed and non-depressed mothers has been shown to negatively impact the quality of the mother-infant relationship (Righetti-Veltema et al., 2002).

Despite the prevalence of fatigue and the potential impact on the mother-infant dyad, evidence-based interventions to alleviate fatigue in the postpartum are virtually non-existent (for exceptions see Thome & Adler, 1999; Troy & Dalgas – Pelish , 2003). Increasing empirical evidence suggest that exercise is an effective treatment for alleviating fatigue in patients with cancer, multiple sclerosis and chronic fatigue (e.g., Dimeo et al., 1999; Fulcher &White, 1997; Mock et al., 1997, Pinto et al., 2005; Puetz et al., 2006; Oken et al., 2004). More recently, in a randomized clinical trial of 88 women, we demonstrated that exercise is effective in alleviating physical fatigue in postpartum depressed women (Dritsa et al., submitted). The intervention was also effective in alleviating mental fatigue for women with lower physical fatigue and greater mental fatigue at study entry.

Given the paucity of randomized trials evaluating exercise interventions in this patient population, much more can be learned from this trial that can help guide application of findings and generate future hypotheses. Understanding which women may best respond to a home–based exercise intervention (moderator analyses), will help to better tailor treatment and improve the design of future intervention trials. Understanding the mechanisms through which exercise alleviates physical fatigue in postpartum depressed women (mediator analyses), may help enhance active components of treatment and contribute to a better understanding of fatigue in postpartum depression.

In the context of a randomized trial, moderators are pre-randomization characteristics that can influence treatment efficacy (Kraemer et al., 2002). A

mediator on the other hand is an event or change that occurs during treatment, may possibly be a result of treatment, and has a main or interactive effect on the outcome (Kraemer et al., 2002). Several clinical and psychosocial factors have been reported to affect fatigue severity in the postpartum and may serve as potential moderating or mediating variables. Among the labour related variables, there is some evidence to suggest that cesarean deliveries and multiparity are associated with more severe postpartum fatigue (Lee & Zaffke, 1999; McGovern et al., 2006; Thompson et al., 2002). While decreased cardiovascular fitness and physical inactivity have been associated with greater fatigue and lower vitality in a variety of populations (e.g., Annesi, 2002; Berlin et al., 2006; Resnick et al., 2006). To date randomized trials evaluating exercise interventions for fatigue have not examined the moderating or mediating effects of cardiovascular fitness levels, however Mock et al., (2005) report significant positive correlations between changes in fitness levels and changes in fatigue following an exercise intervention for women undergoing breast cancer treatment.

Studies examining psychosocial correlates of fatigue in the postpartum demonstrate that greater stress, depressed mood and poor social support can affect fatigue severity (Corwin et al., 2005; Troy, 1999). Conversely, physical activity has been associated with lower perceived stress and anxiety (Da Costa et al., 2003; Steptoe et al., 1998). Randomized clinical trials have shown that aerobic exercise provides an effective means of improving mood in clinically depressed populations (Babyak et al., 2000; Blumenthal et al., 1999; King et al., 1989). Within the larger clinical trial, we showed that home-based exercise was effective in improving postpartum depressed mood as measured by the Hamilton Depression Rating Scale (Da Costa et al., submitted). Given the documented relationship between depressed mood and fatigue (Dennis & Ross, 2005; Mohr et al., 2003), it is likely that baseline depression severity may moderate the effect of exercise on fatigue. Moreover, exercise induced improvements in depressed mood may mediate improvements in fatigue.

Sleep disturbances are common in the postpartum period and have been associated with greater fatigue levels in new mothers (Gay, et al., 2004; Lee, 1998). Several studies in healthy subjects show that regular exercise is associated with better sleep quality (Duane et al., 1998; Youngstedt et al., 1997). This is further corroborated by randomized clinical trials showing improved sleep quality with exercise in populations with sleep difficulties (King et al., 1997; Singh et al., 1997). Improvements of sleep quality with exercise may potentially serve as mediating factors in the relationship between exercise and fatigue in the postpartum.

The focus of the present analyses was to identify potential moderators and mechanisms of the effects of the home-based exercise on changes in fatigue levels. Specifically, the objectives were to explore the following questions:

1. Do clinical factors (delivery mode, parity, time elapsed since delivery), depression levels at study entry, cardiovascular fitness levels, and social support moderate the effects of home-based exercise on mental and physical fatigue in postpartum depressed women.
2. Are changes in depressed mood, sleep quality, perceived stress, physical fitness, and exercise related energy expenditure, mechanisms through which exercise alleviates physical fatigue in postpartum depressed women.

Method

Participants

Women in the postpartum period (4-38 weeks) experiencing symptoms of postpartum depression were recruited at obstetrician/gynecologists offices and through media advertisement, pamphlets and flyers sent to delivery units of major hospitals in the Montreal area and to community health facilities. Interested participants were screened over the telephone and those obtaining a score ≥10 on the Edinburgh Postnatal Depression Scale (EPDS) (Cox et al., 1987) were invited to participate. This trial was carried out from November 2001 until November 2004. The study was approved by the McGill University Faculty of Medicine Institutional Review Board. All subjects signed informed consent.

Outcome Measures

The Multidimensional Fatigue Inventory (MFI-20) (Smets et al., 1995) is a self-report instrument developed to assess the various components of fatigue. The 20 items generate 5 subscales comprised of 4-items. The subscales are: General Fatigue (e.g., "I feel tired"), Physical Fatigue (e.g., "Physically I feel only able to do a little"), Reduced Activity (e.g., "I think I do very little in a day"), Reduced Motivation (e.g., "I dread having things to do") and Mental Fatigue (e.g., "My thoughts easily wander"). The response scale consists of 5 boxes reflecting degree of agreement with the statement to disagreement. Higher scores indicate a higher degree of fatigue (Smets et al., 1995; Smets et al., 1996). The alpha coefficients range from satisfactory to good (α = .76-.88) (Smets et al., 1995). The alpha coefficient range for the present sample was acceptable to good (α = .64-.85), with the lowest coefficient obtained for the Reduced Motivation subscale. The MFI-20 has been validated with healthy and clinical (e.g., cancer, chronic fatigue syndrome) populations (Smets et al. 1995; Smets et al, 1996). Moderate correlations with the Beck Depression Inventory indicate that although the concepts measured may be related, they can be measured in

distinct ways (Schneider, 1998). Changes on the Physical and Mental Fatigue subscales were used as outcome measures.

Potential Mediators and Moderators

A semi-structured telephone interview was developed to inquire about major complications experienced during pregnancy and labor/delivery, demographic information (age, parity, education), and medical history (current and prior medical conditions).

The EPDS is a widely used 10-item scale developed and validated for new mothers to measure depressive symptomology (Cox et al., 1987). Items inquire about maternal mood in the past seven days and are rated on a 4-point scale. Somatic symptoms likely to occur in the postpartum are not included. A cutoff point of 10 has been shown to have a sensitivity of 84% to 100% and a specificity of 76% to 88% when compared to a diagnosis of minor and major depression using a psychiatric interview such as the Structured Clinical Interview for the DSM-II-R (Harris et al., 1989; Murray & Carothers, 1990; Zelkowitz & Milet, 1995). Baseline pre-randomization scores were evaluated as potential moderators, while change scores from baseline to post-treatment were evaluated as potential mediators.

Sleep quality was assessed with the Pittsburgh Sleep Quality Index (PSQI), a self-report measure assessing sleep quality and disturbances over a 1-month time interval (Buysse, et al., 1989). The 19 items generate seven component scores: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. A global score is obtained by summing the seven component scores. The scale demonstrates good psychometric properties with a global score of greater than 5 yielding a diagnostic sensitivity of 89.6% and specificity of 86.5% in differentiating good and poor sleepers. Change in global PSQI scores from baseline to post-treatment were evaluated as potential mediators of the effects of the intervention on physical fatigue.

Stress was evaluated with the Perceived Stress Scale (PSS), a 10-item scale that measures the extent to which situations in one's life are appraised as stressful in

the past month (Cohen & Williamson, 1988). The PSS has been shown to have adequate internal and test-retest reliability and is positively correlated with a number of self-report and behavioral measures of stress in adult populations (Cohen & Williamson, 1988). The mediating effects of changes in PSS from baseline to post-treatment were evaluated.

Social support was measured with the MOS social support survey (Sherbourne & Stuart, 1991). This seven item scale measures perceived support from one's social network. Perceived availability of social support is rated on a five-point scale ranging from "Not at all" to "Always" (0-4). Higher scores indicate greater perceived support. This measure shows good internal consistency (0.88) (Sherbourne & Stuart, 1991). The moderating effect of social support at study entry was evaluated.

The Aerobic Centre Longitudinal Study Physical Activity Questionnaire (ACLS-PAQ) was used to track exercise participation (Cooper Institute for Aerobics Research, 1997). The ACLS-PAQ is a brief validated instrument assessing leisure time physical activity and household activities. Participants provide information about activities performed regularly in the last 3 months, frequency per week, intensity level and duration per session. A total physical activity score and total physical activity score excluding household activities, stair climbing and lawn work can be expressed to distinguish between physical activity and exercise. These scores are estimates of weekly energy expenditure expressed as MET (metabolic equivalent) -hours per week. One MET is equal to the resting metabolic rate of an individual, which is 3.5 mLs of oxygen per kilogram body mass per minute. The intensity of the activity reported is converted to a MET value by using various compendia of physical activity (e.g., Ainsworth et al., 2000). The ACLS-PAQ has been validated in female samples and correlates with objective measures of physical fitness (Dinger et al., 2000; Kohl et al, 1988). ACLS-PAQ exercise scores (ACLEX) at post-treatment were evaluated as potential mediators on the effect of exercise on physical fatigue.

Cardiovascular Fitness was measured using a maximal graded exercise stress test on a treadmill. Using a Bruce protocol, the test consisted of increasing workloads of approximately three metabolic equivalents every three minutes until the subject reaches volitional exhaustion or any of the American College of Sports Medicine (ACSM) indicators for stopping an exercise test (Bruce et al., 1973; ACSM, 1995). A 12-lead electrocardiogram measured heart rate and rhythm at rest, continuously during the test and for 5 minutes during recovery. Blood pressure was measured at rest and every two minutes during exercise and recovery. Fitness was then evaluated by time on test and maximal METs capacity. Baseline fitness was examined as a potential moderator of the effects of exercise on mental and physical fatigue, while change in fitness levels with exercise was evaluated as a potential mediator on the effect of exercise on physical fatigue.

Procedures

This study was part of a randomized trial evaluating the effects of home-based exercise on postpartum depressed mood (Da Costa et al., submitted). Following the initial telephone interview, consenting participants were mailed the questionnaire battery along with a pre-addressed stamped envelope. Women were instructed to complete the questionnaires and return them promptly by mail. Reminder phone calls were made to subjects whose questionnaires had not been received within 2 weeks of mailing.

All participants then underwent a physician supervised cardiovascular fitness test. Baseline fitness was evaluated by time on test and maximal metabolic equivalents (METs) capacity. Following the exercise stress test, participants were randomly assigned to either the exercise or the control group. Information from the baseline fitness test was used to individualize exercise programs for women assigned to the exercise group. Following the 12-week intervention phase, all participants completed a second physician supervised cardiovascular fitness test.

All questionnaires were mailed to participants. Women were instructed to complete the questionnaires and return them in the pre-addressed stamped envelops via the post.

Exercise Intervention. Participants assigned to the exercise group met four times with the same exercise physiologist during a 12-week training phase. The first visit was approximately 90 minutes and included a review of the cardiovascular fitness test results, an overview on the benefits of exercise, an individualized exercise prescription, and a supervised exercise session. Principles of warm-up and cool-down, and general exercise precautions were reviewed to minimize the risk of injury. Follow-ups were scheduled at 1, 3, and 9 weeks following the initial visit. The follow-up sessions consisted of providing guidance and support to the participants, solving any difficulties, and gradually increasing the amount and intensity of the exercise.

The exercise prescription was individualized and followed guidelines from ACSM for developing and maintaining cardiorespiratory fitness (ACMS, 1998). These guidelines suggest individuals perform 60-120 minutes/week of aerobic exercise within their target heart rate zone (60-85% of maximal heart rate). Duration is dependent on the intensity of the activity. Programs were tailored to the individual depending on accessibility to equipment, time constraints, weather and enjoyment of various activities. The intensity of the exercise began at 60-70% of maximal heart rate for all individuals and was gradually increased to as high as 75-85%, depending on the subject's adaptation to the exercise. Stretching and strength exercises were also prescribed, with the amount of each depending on the subject's needs.

Heart rate monitors were provided to assure proper intensity of training. All subjects maintained an exercise log for the duration of the 12-week training phase and monthly thereafter. Participants completed exercise logs following each exercise session and logged information pertaining to the type of exercise performed (i.e., stretching, cardiovascular), frequency, duration, and heart rate. Average weekly adherence rates across the 12-week exercise-training phase were calculated as the

ratio of the number of exercise sessions reported to the minimum number of sessions prescribed (i.e., 60 minutes of cardiovascular exercise per week).

Statistical Analyses

Data was entered and analyzed using SPSS version 12. Descriptive statistics including means, medians, and standard deviations for quantitative variables and proportions for categorical variables were calculated for all baseline variables, and then were used to compare the two groups with respect to baseline values.

All outcome variables, potential mediators and moderators were normally distributed, except for significant positive skewness of the ACLS-PAQ exercise scores at baseline and post-treatment. Square root transformations were applied.

A Pearson correlation matrix was computed with all the variables to examine the bivariate correlations between the change from baseline scores for each outcome variable at each assessment (physical and mental fatigue) and each potential mediator and moderator variable.

Only the subsample of participants who adhered with the exercise intervention was included in the analyses. For participants with missing data at a given assessment point, we imputed the last available value for a given outcome, using the last observation carried forward approach. For women who did not complete or return their weekly exercise logs we considered that they did not exercise on that given week. Because mediator and moderator analyses were secondary analyses, with lower statistical power than primary analyses, effect sizes were also computed for all potential moderators and mediators by dividing the difference between group mean change scores by the pooled standard deviation (Cohen, 1988). A moderate to large effect size would be indicative of a real difference that did not attain statistical significance due limited statistical power.

To identify potential moderators we investigated whether the effects of the intervention on the mean change in mental and physical fatigue depended on clinical variables such as parity , weeks since delivery, mode of delivery or cardiovascular fitness at study entry, or on the baseline value of psychosocial variables (EPDS,

Social Support) . Hypotheses were tested by computing a series of linear regressions with group by baseline interaction terms. Following recommendations proposed by Aiken and West (1991) these terms were entered in the final step of each multiple regression model. All models were adjusted for baseline physical and mental fatigue scores.

Potential mediators of the effect of exercise on physical fatigue were tested using guidelines provided by Baron and Kenny (1986). A series of regressions were computed to evaluate whether:

a) The independent variable affects the dependent variable in the absence of the mediator.
b) The independent variable affects the mediator.
c) The effect of the independent variable on the dependent variable is reduced in the presence of the mediator.

The mediation paths were then tested directly using Sobel's test (Sobel, 1982, MacKinnon et al., 2002). Potential mediators included change in cardiovascular fitness (METS), reported levels of exercise over the intervention phase (ACLEX), change in depression scores (EPDS), change in sleep quality (PSQI), and change in perceived stress (PSS). All regression models testing potential mediators were adjusted for baseline physical and mental fatigue.

Results

Flow of participants has been previously described (Dritsa et al, submitted). Eighty-eight women were successfully randomized, 46 were assigned to the exercise group and 42 to the control group. During the 12–week training phase adherence to the aerobic exercise component of the program was 76.1% (based on 60 min/week), with an average of 124.09 min/week (SD = 96.33). Thirty-five out of the 46 women in the exercise group adhered to the exercise intervention. Women in the control group reported an average of 54.6 min/week *(SD=55.8)* of aerobic exercise during the 12-week period.

Characteristics at study entry of the 35 women who adhered to the intervention compared to the control group are summarized in Table 1. The groups were similar on all baseline characteristics, except for a significant difference in baseline mental fatigue scores (t (75) = 2.32, $p < .05$), as well as a small difference in the proportion of primiparous women and in the frequency of caesarean births that did not reach statistical significance (χ^2 (1, N=77) = .74, p =.40 ; χ^2 (1, N=77) = 2.3, p =.13, respectively)

To avoid the risk of confounding the between-group comparisons by this imbalance, all multivariate analyses were adjusted for baseline mental fatigue scores.

There were no differences on baseline characteristics, outcome variables, or potential moderator and mediator variable between participants completing all assessments and those with missing data (Data not shown).

Potential Moderators

As summarized in Table 2, of the six variables examined as potential moderators of the effects of the intervention on change in physical fatigue scores, we obtained statistical trends for number of weeks since delivery, parity and physical fitness at study entry. Women in the exercise group entering the study after 9.4 weeks postpartum showed a somewhat larger decrease in physical fatigue. Simple slope analyses showed that parity was a significant moderator in the control group, but not in the exercise group. Women in better cardiovascular fitness at study entry showed greater decreases in physical fatigue with exercise compared to women who were less fit. Given the small effect sizes for the remainder of the variables no other interactions were explored.

Moderators of changes in mental fatigue scores are presented in Table 3. The intervention was effective in alleviating mental fatigue in women that entered the study later in the postpartum period (9.4 weeks post-delivery) and for women with higher depression scores (EPDS>12). Women in the control group with less perceived social support at study entry showed less change in mental fatigue compared to women in the control group with more perceived social support. There

was no significant moderating effect of social support in the exercise group. Statistical trends were also obtained for parity and delivery mode, with multiparous women and women delivering vaginally showing somewhat larger improvements in mental fatigue with exercise.

Potential Mediators of Change in Physical Fatigue with Exercise

Effect size for the outcome variables and potential mediators are presented in Table 4. Moderate effect sizes were obtained for change in perceived stress, level of exercise related energy expenditure and change in sleep quality.

Univariate correlations showed no significant relationship between changes in EPDS scores and treatment (r = .12, p = .31), nor between change in METS and treatment (r = -.04, p = .712), hence these variables were not further explored as potential mediators.

The results of the hierarchical regression models examining potential mediators are summarized in Figure 1. As illustrated in Figure 1a, the standardized regression coefficient between exercise and perceived stress was significant (t = 2.13, p < .05), as was the regression coefficient between perceived stress and change in physical fatigue (t= 4.54, p < .001). After controlling for perceived stress, there was a reduction in the standardized regression coefficient for exercise from β = 2.89 (p = .001) to β = 2.09 (p <. 01) indicating that the effect of the intervention on physical fatigue was partially mediated by decrease in perceived stress with exercise. Sobel's test was marginally significant (z = 1.93, p = .05), with 27.8 % of the total effect mediated by changes in perceived stress.

Figure 1b illustrates the coefficients obtained from the hierarchical regression models evaluation ACLEX as a potential mediator. The standardized regression coefficient between the intervention and ACLEX was significant (t = 3.31, p = .001), as was the regression coefficient for ACLEX and change in physical fatigue (t = 2.26, p < .05). The reduction in the standardized regression coefficient for exercise from β = 2.89 (p = .001) to β = 2.21 (p < . 01), once ACLEX was controlled for provides

initial evidence for partial mediation. Sobel's test was marginally significant (z = 1.86, p = .06), with 23.52 % of the total effect mediated by exercise related energy expenditure. The linear regression evaluating the impact of the intervention on change in PSQI did not reach statistical significance ($F(3,73) = 2.01, p = .120$).

Discussion

We have previously reported that the supervised home-based exercise intervention was effective in alleviating physical fatigue in postpartum depressed women (Dritsa et al., submitted). The intervention was also effective in alleviating mental fatigue in women with lower baseline physical fatigue scores and those with higher baseline mental fatigue scores. The purpose of the analyses was to further explore moderators of the effects of exercise on physical and mental fatigue in postpartum depressed women, as well as mediators of the effects of exercise on physical fatigue scores.

Moderator analyses for physical fatigue showed that supervised home-based exercise may be more effective in women who start exercising later in the postpartum period (i.e., $\geq$ 9.4 weeks) and for women with better cardiovascular fitness. However these findings need to be interpreted cautiously given the statistical trends and small effect sizes observed. The absence of a moderating effect of baseline depression is unexpected in light of the documented relationship between depression and fatigue (e.g., Dennis & Ross, 2005). However, most studies reporting a relationship between fatigue and depression have measured fatigue unidimensionally (e.g., Corwin et al., 2005; Dennis & Ross, 2005; Mohr et al., 2003). One recent study using a multidimensional assessment of fatigue found depression to be associated with mental, but not physical dimensions of fatigue (Lim at al., 2005). It appears that exercise may be an effective method of alleviating physical fatigue in postpartum depressed women regardless of baseline depression severity as measured by the EPDS. This finding is clinically relevant given the potential impact of fatigue on the mother-infant relationship in depressed and non-depressed mothers (Righetti-Veltema et al., 2002).

As reported elsewhere, supervised home-based exercise was effective in alleviating mental fatigue in women with lower baseline physical fatigue as well as in those with higher baseline mental fatigue scores (Dritsa et al., submitted). The present findings further our understanding of which subgroup of postpartum depressed women may benefit from home-based exercise to alleviate mental fatigue. The intervention was effective in alleviating mental fatigue in women entering the study after approximately nine weeks post delivery. One plausible explanation for this finding maybe that the introduction of an additional demand (i.e., initiation of an exercise program) in the early postpartum, when women are already coping with multiple new demands, may outweigh the potential benefits of reduction of mental fatigue with exercise. One study has demonstrated a significant relationship between stimulation overload and greater mental fatigue as measured by the MFI, providing some support for this hypothesis (de Rijk et al., 1999).

The intervention was effective in alleviating mental fatigue scores for women with higher baseline depression scores. This finding parallels the moderating effect of baseline mental fatigue (Dritsa et al., submitted). Mentally fatigued women with more severe depression may best respond to interventions that require little focused attention (e.g., walking), that potentially provide distraction from stress (Paluska & Schwenk, 2000), without further taxing cognitive resources (i.e., reading, carrying a conversation) (de Rijk et al., 1999; Stark & Cimprich , 2003) .

The statistical trends observed with regards to parity and mode of delivery suggest that multiparous women and those who deliver vaginally may be more likely to show improvements in mental fatigue with exercise, however these effects need to be verified and further explored in studies that are designed to specifically assess moderating effects.

Mechanisms

While there is growing empirical evidence as to the effectiveness of exercise in alleviating fatigue, empirical knowledge regarding the mechanisms through which this occurs is lacking. The fact that fatigue can be a symptom manifestation

associated with a variety of physical and psychiatric conditions further complicates the search for mechanisms, as they may be disease specific (Lange et al., 2005). We attempted to explore some of the potential mechanisms involved in the alleviation of physical fatigue with exercise in postpartum depressed women.

The absence of a significant direct effect of exercise on depressed mood as measured by the EPDS did not allow for further exploration of the possible mediating role of improvements in depressed mood. Mohr et al., (2003), report covariations in improvements of fatigue with treatment of depressed mood in a sample of multiple sclerosis patients. However given the unidimensional assessment of fatigue in their study, it is unclear if these covariations were primarily driven by changes in physical or mental fatigue.

Reduction in perceived stress with exercise partially mediated the observed reduction in physical fatigue. The brain and body respond to perceived stress by an activation of the hypothalamic-pituitary-adrenal axis and the sympathetic nervous system preparing the body to "fight or flight" (Tsatsoulis & Fountoulakis, 2006). It is therefore biologically plausible that reductions in perceived stress with exercise would lead to alleviation of physical fatigue, in that the body's resources are being taxed less often. Moreover, previous studies have reported that maternal stress may negatively affect mothers' attempts to become physically active (Urizar et al., 2005). Enhancing the stress reduction component of an exercise intervention may improve effects on physical fatigue and facilitate greater exercise participation.

Improvements in physical fatigue were also partially mediated by level of exercise related energy expenditure. The mediational role of exercise related energy expenditure lends some support to the argument that the observed improvements in physical fatigue were not exclusively attributable to the exercise therapist's attention and/or women's expectations that they would benefit from the exercise intervention. The lack of a significant association between the intervention and changes in cardiorespiratory fitness indicates that the improvements did not require an accompanying significant change in fitness level. Hence, increasing activity levels in

postpartum depressed women may effectively alleviate physical fatigue even in the absence of significant effects on cardiorespiratory fitness.

Limitations

The present analyses were exploratory, with lower statistical power than the primary outcome analyses and risk for false-negative findings. Moreover, decrease in perceived stress and increase in energy expenditure were partial mediators explaining only a portion of the effects of home-based exercise on fatigue. Other variables such as change in body mass index or improved immune functioning with exercise may also be important mediators to consider in future studies (Lim et al., 2005).

Also as previously reported, participants in our study were highly educated and volunteered to participate in a home-based exercise program, these results may not be generalizable to populations with different demographics characteristics.

Conclusions

The present findings indicate that supervised home-based exercise was effective in alleviating physical fatigue in postpartum depressed women independent of the severity of baseline depression scores as measured by the EPDS.

The intervention was also effective in alleviating mental fatigue for a subgroup of women. Postpartum depressed women with low physical fatigue, higher mental fatigue, and more severe depressed mood showed improvements in mental fatigue with supervised home-based exercise. Identification of these moderators allows for the tailoring of home-based exercise to particular subgroups of women that are most likely to benefit.

Improvements in physical fatigue with exercise were partially explained by increased levels in exercise related energy expenditure and a reduction in perceived stress. These components may be enhanced and directly tested in future exercise trials.

References

Aiken LS, West SG (1991) Multiple regression: Testing and interpreting interactions. Sage , Thousand Oaks.

Ainsworth BE, Haskell WL, Whitt MC, Irwin ML, Swartz AM, Strath SJ, O'Brien WL, Bassett DR Jr., Schmitz KH, Emplaincourt PO, Jacobs DR Jr. , Leon AS (2000) Compendium of physical activities: an update of activity codes and MET intensities. Med Sci Sports Exerc 32: S498-S504.

American College of Sports Medicine (1993) Resource manual for guidelines for exercise testing and prescription (2nd ed.). Lea & Febiger: Philadelphia.

American College of Sports Medicine (1998) American College of Sports Medicine Position Stand. The recommended quantity and quality of exercise for developing and maintaining cardiorespiratory and muscular fitness, and flexibility in healthy adults. Med Sci Sports Exerc 30: 975-91.

Annesi JJ. (2002) Relation of rated fatigue and changes in energy after exercise and over 14 weeks in previously sedentary exercisers. Percept Mot Skills 95: 719-727.

Babyak M, Blumenthal JA, Herman S, Kharti P, Doraiswamy M, Moore KA, Craighead WE, Baldewicz TT, Krishan R (2000) Exercise treatment for major depression: Maintenance of therapeutic benefit at 10 months. Psychosom Med 62: 633-638.

Baron RM, Kenny DA (1986). The moderator-mediator variable distinction in social psychology research: Conceptual, strategic, and statistical considerations. J Pers Soc Psychol 51:1173-1182.

Blumenthal JA, Babyak MA, Moore KA, Craighead WE, Herman S, Kharti P, Waugh R, Napolitano MA, Forman LM, Appelbaum M, Doraiswamy M, Krishan R (1999) Effects of exercise training on older patients with major depression. Arch Intern Med 159: 2349-2356.

Berlin AA, Kop WJ, Deuster P (2006) Depressive mood and fatigue after exercise withdrawal: The potential role of decreased fitness. Psychosom Med 68: 224-230.

Bruce RA, Kusumi F, Hosmer D (1973) Maximal oxygen uptake and nomographic assessment of functional aerobic impairment in cardiovascular disease. Am Heart J 85: 546-562.

Buysse DJ, Reynolds CF, Monk TH, Berman SR, Kupfer DJ (1989) The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research. Psychiatry Res 28: 193-213.

Cohen J (1988) Statistical power for the behavioral sciences. Second Edition. Erlbaum Associates, Hillsdale, NJ.

Cohen S, Williamson GM (1988) Perceived stress in a probability sample in the United States. In S. Spacapan and S Oskamp (Eds), The social psychology of health. Sage, Newbury Park, CA, p. 31-67.

Cooper Institute for Aerobic Research (1997) The Aerobics Centre Longitudinal Physical Activity Questionnaire (ACLS-PAQ_). Med Sci Sports Exerc 29: S10-S14.

Corwin EJ, Brownstead J, Barton N, Heckard S, Morin K (2005) The impact of fatigue on the development of postpartum depression. J Obstet Gynecol Neonatal Nurs 34: 577-586.

Cox JL, Holden JM, Sagovsky R (1987) Detection of postnatal depression: Development of the 10-item Edinburgh postnatal depression scale. Br J Psychiatry 150: 782-786.

Da Costa D, Lowensteyn I, Abrahamowicz M, Ionescu-Ittu R, Dritsa M, Rippen, N, Cervantes P, Khalifé S (2006) A randomized clinical trial of exercise to alleviate postpartum depression. Manuscript submitted for publication.

Da Costa D, Rippen N, Dritsa M, Ring A (2003) Self-reported leisure-time physical activity during pregnancy and relationship to psychological well being. J Psychosom Obstet Gynaecol 24:111-119.

De Rijk AE, Schruers KMG, Bensing JM (1999) What is behind "I'm so tired"? Fatigue experiences and their relations to quality and quantity of external stimulation. J Psychosom Res 47: 509-523.

Dennis CL, Ross L (2005) Relationships among infant sleep patterns, maternal fatigue, and development of depressive symptomatology. Birth 32: 187-193.

Dimeo FC, Stieglitz RD, Noveli-Fischer U, Fetscher S, Keul J (1999) Effects of physical activity on the fatigue and psychologic status of cancer patients during chemotherapy. Cancer 85: 2273-2277.

Dinger MK, Massie J, Ransdell L (2000) Physical activity certified health education specialists. J Health Educ 31: 98-104.

Dritsa M, Da Costa D, Dupuis G, Lowensteyn I, Khalifé S (2006) Effects of a home-based exercise intervention on fatigue in postpartum depressed women: Results of a randomized controlled trial. Manuscript submitted for publication.

Duane LS, Kotchou K, Quan SF (1998) Association of physical activity and human sleep disorders. Arch Intern Med 158: 1894-1898.

Fulcher KY, White PD (1997). Randomised controlled trial of graded exercise in patients with the chronic fatigue syndrome. BMJ 314: 1647-1652.

Gay CL, Lee KA, Lee S-Y (2004) Sleep patterns and fatigue in new mothers and fathers. Biol Res Nurs 5: 311-318.

Harris B, Huckle P, Thomas R, Johns S, Fung H (1989) The use of rating scales to identify post-natal depression. Br J Psychiatry 154: 813-817.

King AC, Oman RF, Brassington GS, Bliwise DL, Haskell WL (1997) Moderate-intensity exercise and self-rated quality of sleep in older adults: a randomized controlled trial. JAMA 277: 32-37.

King AC, Taylor CB, Haskell WL, Debusk, RF (1989) Influence of regular aerobic exercise on psychological health: a randomized, controlled trial of healthy middle-aged adults. Health Psychol 8: 305-324.

Kohl HW, Blair SN, Paffenbarger RS Jr, Macera CA, Kronenfeld JJ (1988) A mail survey of physical activity habits as related to measured physical fitness. Am J Epidemiol 127: 1228-1239

Kraemer HC, Wilson T, Fairburn CG, Agras WS (2002) Mediators and moderators of treatment effects in randomized clinical trials. Arch Gen Psychiatry 59: 877-883.

Lange G, Cook DB, Natelson BH (2005) Rehabilitation and treatment of fatigue. In J De Luca (Ed), Fatigue as a window to the brain. The MIT Press, Cambridge Massachusetts, p 301-316.

Lee KA (1998) Alterations in sleep during pregnancy and the postpartum: a review of 30 years of research. Sleep Med Rev 2: 231-242.

Lee KA, Zaffke M (1999) Longitudinal changes in fatigue and energy during pregnancy and the postpartum period. J Obstet Gynecol Neonatal Nurs 28: 183-191.

Lim W, Hong S, Nelesen R, Dimsdale JE (2005) The association of obesity, cytokine levels, and depressive symptoms with diverse measures of fatigue in healthy subjects. Arch Intern Med *25*: 910-915.

MacKinnon DP, Lockwood CM, Hoffman JM, West SG, Sheets V (2002) A comparison of methods to test the significance of the mediated effect. Psychol Methods *7*: 83-104.

McGovern D, Dowd B, Gjerdingen D, Gross CR, Kenney S, Ukestad L, McCaffrey D, Lundberg U (2006) Postpartum health of employed mothers 5 weeks after childbirth. Ann Fam Med 4: 159-167.

Mock V, Frangakis C, Davidson NE, Ropka MC, Pickett M, Poniatowski B, Stewart, KJ, Cameron L, Zawaki K, Podewils LJ, Cohen G, McCorkel R (2005) Exercise manages fatigue during breast cancer treatment: A randomized controlled trial. Psychooncology 14: 464-477.

Mock V, Hassey-Dow K, Meares CJ, Grimm PM, Dienemann JA, Haisfield-Wolfe ME, Quitasol W, Mitchell S, Chakravarthy A, Gage I (1997) Effects of exercise on fatigue, physical functioning, and emotional distress during radiation therapy for breast cancer. Oncol Nurs Forum 24: 991-1000.

Mohr DC, Hart SL, Goldenberg A (2003) Effects of treatment for depression on fatigue in multiple sclerosis. Psychosom Med *65*: 542-547.

Murray L, Carothers AD (1990) The validation of the Edinburgh Post-natal Depression Scale on a community sample. Br J Psychiatry 157: 288-290.

Oken BS, Kishiyama S, Zajdel D, Bourette D, Carlsen J, Haas M, Hugos C, Kraemer DF, Laurence J, Mass M (2004) Randomized controlled trial of yoga and exercise in multiple sclerosis. Neurology 62: 2058-2064.

Paluska, SA, Schwenk, TL (2000) Physical activity and mental health: Current Concepts. Sports Med 29: 167-180.

Pinto B, Frierson GM, Rabin C, Trunzo JJ, Marcus BH (2005) Home-based physical activity intervention for breast cancer patients. J Clin Oncol 23: 3577-3587.

Puetz T, O'Connor P, Dishman RK (2006) Effects of chronic exercise on feelings of energy and fatigue: A quantitative synthesis. Psychol Bull 132: 866-876.

Resnick HE, Carter EA, Aloia M, Phillips B (2006). Cross-sectional relationship of reported fatigue to obesity, diet, and physical activity: Results from the Third National Health and Nutrition Examination. J Clin Sleep Med 2: 163-169.

Righetti-Veltema M, Conne-Perréard E, Bousquet A, Manzano J (2002) Postpartum depression and mother-infant relationship at 3 months old. J Affect Disord 70: 291-306.

Saurel-Cubizolles MJ, Romito P, Lelong N, Ancel PY (2000) Women's health after childbirth: A longitudinal study in France and Italy. BJOG 107: 1202-1209.

Schneider RA (1998) Concurrent validity of the Beck depression inventory and the Multidimensional Fatigue Inventory-20 in assessing fatigue among cancer patients. Psychol Rep 82: 883-886.

Sherbourne CD, Stewart AL (1991) The MOS Social Support Survey. Soc Sci Med 32: 705-714.

Singh NA, Clements KM, Fiatarone MA (1997) A randomized clinical trial of the effect of exercise on sleep. Sleep 20: 95-101.

Smets, EMA, Garssen, B, Bonke, B, de Haes, JC (1995) The multidimensional fatigue inventory (MFI): Psychometrics qualities of an instrument to assess fatigue. J Psychosom Res 39: 315-325.

Smets EMA, Garssen B, Cull A, de Haes JC (1996) Application of the multidimensional fatigue inventory (MFI-20) in cancer patients receiving radiotherapy. Br J Cancer 73: 241-245.

Sobel ME (1982) Asymptotic confidence intervals for indirect effects in structural equation models. In S. Leinhardt (Ed.), Sociological methodology. American Sociological Association, Washington DC, p 290-312.

Stark MA , Cimprich B (2003) Promoting attentional health: importance to women's lives. Health Care Women Int 24: 93-102.

Steptoe A, Edwards S, Moses J, Mathews A (1989) The effects of exercise training on mood and perceived coping ability in anxious adults from the general population. J Psychosom Res 33: 537-547.

Thome M, Adler B (1999) A telephone intervention to reduce fatigue and symptom distress in mothers with difficult infants in the community. J Adv Nurs 29: 128-137.

Thompson JF, Roberts CI, Currie M, Ellwood DA (2002) Prevalence and persistence of health problems after childbirth: Association with parity and method of birth. Birth 29: 83-94.

Troy NW (1999) A comparison of fatigue and energy levels at 6 weeks and 14 and 19 months postpartum. Clin Nurs Res 8: 135-152.

Troy NW, Dalgas-Pelish P (2003) The effectiveness of a self-care intervention for the management of postpartum fatigue. Appl Nurs Res 16: 38-45.

Tsatsoulis A, Fountoulakis S (2006) The protective role of exercise on stress system dysregulation and comorbidities. Ann N Y Acad Sci, 1083: 196-213.

Urizar GG, Hurtz SQ, Ahn DK, King AC, Albright CL, Atienza AA (2005) Influence of maternal stress on successful participation in a Physical Activity intervention the IMPACT project. Women Health 42: 63-82.

Youngstedt SD, O'Connor PJ, Dishman RK (1997) The effects of acute exercise on sleep: A quantitative synthesis. Sleep 20: 203-214.

Zelkowitz P, Milet TH (1995) Screening for postpartum depression: A community sample. Can J Psychiatry 40: 80-86.

Table 1.

Patient Characteristics at Study Entry

	Exercise (n= 35)	Control (n= 42)
	Mean (SD)	*Mean (SD)*
Age (years)	34.57 (3.36)	32.67 (4.80)
Education (years)	16.03 (1.56)	15.10 (2.22)
Years with current partner	7.40 (4.23)	6.15 (3.62)
	Mean (SD)	*Mean (SD)*
Weeks since delivery	10.83 (7.07)	12.09 (8.08)
Body Mass Index	27.05 (5.75)	26.43 (4.92)
METS at stress test	10.67 (1.79)	11.01 (1.66)
	%	%
Primiparous	42.8	33.3
Cesarean Delivery	37.1	21.4
Outcomes	*Mean (SD)*	*Mean (SD)*
Physical Fatigue	14.70 (3.23)	13.55 (4.25)
Mental Fatigue	14.52 (4.00)	12.60 (4.54)

Table 2.

Moderators of Physical Fatigue: Adjusted Change Scores, Effect Sizes and Regression Results

	Exercise	Control	*ES* †	Test of interactions	
	Mean change (SD)	*Mean change (SD)*		*β*	*p*
Weeks §					
≤ 9.4 (n=39)	-4.32 (3.48)	-1.78 (3.57)	0.72	.282	.066
> 9.4 (n=38)	-4.73 (3.43)	-1.50 (3.44)	0.94		
Parity					
Primiparous (n=29)	-4.28 (3.38)	-3.24 (3.36)	0.31	.243	.076
Multiparous (n=48)	-4.70 (3.36)	-0.84 (3.35)	1.15		
Delivery Mode					
Vaginal (n=55)	-4.83 (3.56)	-1.71 (3.46)	0.89	.030	.834
C-section (n=22)	-4.05 (3.41)	-1.30 (3.42)	0.81		
Mets §					
≤ 10.5 (n=38)	-3.95 (3.38)	-2.11 (3.49)	0.33	.243	.078
>10.5 (n=39)	-5.08 (3.52)	-1.11 (3.37)	1.15		
EPDS †					
≤ 12 (n=38)	-3.82 (3.42)	-1.43 (4.02)	0.64	.152	.294
> 12 (n=39)	-5.16 (3.67)	-1.78 (3.40)	0.96		
Social support §					
Lo ≤ 17(n=37)	-3.72 (3.42)	-0.68 (3.30)	0.88	.020	.884
Hi > 17(n=40)	-5.55 (3.30)	-2.55 (3.44)	0.89		

Note: † Between group effect size; § Groupings based on median split; † Grouping based on clinically meaningful established cutoff (Cox et al., 1987)

Table 3.
Moderators of Mental Fatigue: Adjusted Change Scores, Effect Sizes and Regression Results

	Exercise	Control	ES†	Test of Interactions	
	Mean change (SD)	*Mean change (SD)*		*β*	*p*
Weeks since delivery §					
≤ 9.4 weeks (n=39)	-0.97 (4.13)	-3.07 (4.23)	0.50	.518	.001
>9.4 wks (n=38)	-4.95 (4.07)	-1.85 (4.06)	0.77		
Parity					
Primiparous (n=29)	-1.89 (4.32)	-3.46 (4.29)	0.36	.251	.091
Multiparous (n=48)	-3.75 (4.28)	-1.90 (4.28)	0.43		
Delivery Mode					
Vaginal (n= 55)	-4.21 (4.35)	-2.15 (4.24)	0.48	-.279	.063
C-section (n=22)	-1.03 (4.17)	-3.10 (4.24)	0.49		
Mets §					
≤ 10.5 (n=38)	-3.22 (4.29)	-2.96 (4.43)	0.06		.306
>10.5 (n=39)	-2.66 (4.45)	-1.87 (4.28)	0.18	.152	
EPDS †					
≤ 12 (n=38)	-1.70 (4.26)	-2.74 (4.46)	0.24	.374	.014
>12 (n=39)	-4.01 (4.56)	-1.91 (4.24)	0.48		
Social Support §					
Lo ≤ 17 (n=37)	-3.06 (4.40)	-1.30 (4.24)	0.41	-.326	.029
Hi > 17 (n=40)	-2.70 (4.23)	-3.40 (4.42)	0.16		

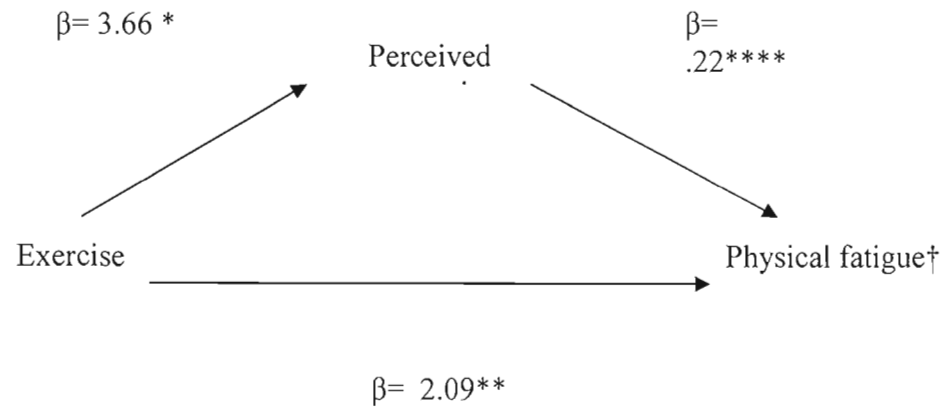
† Between group effect size; § Groupings based on median split; † Groupings based on clinically meaningful established cutoff (Cox et al., 1987)

Table 4

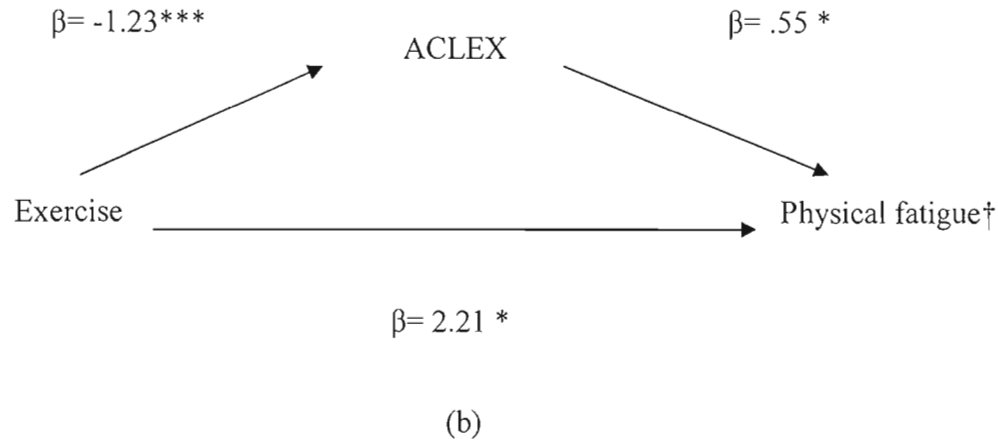
Effect Sizes for Outcome Measures and Potential Mediators of Change in Physical Fatigue

	Exercise	Control		
	Mean change (SD)	*Mean change (SD)*	*ES* between†	*p*
Outcomes				
Physical Fatigue	-4.53 (3.44)	-1.63 (3.42)	0.85	.001
Mental Fatigue	-2.96 (4.33)	-2.41 (4.34)	0.12	.586
Mediators				
EPDS	-5.00 (5.42)	-4.17 (5.42)	.15	.515
METS	.61 (1.43)	.53 (1.43)	.06	.824
PSQI global	-2.74 (3.49)	-1.5 (3.48)	.35	.133
PSS-10	-7.02 (7.32)	-3.36 (7.36)	.50	.036
	Mean (SD)	*Mean (SD)*		
ACLEX	3.60 (1.60)	2.37 (1.59)	.77	.001

Note: † Between group effect size, EPDS= Edinburgh Postnatal Depression Scale, ACLEX = exercise related energy expenditure as measured by ACLS-PAQ, METS= METS achieved at baseline stress-test, PSQI global= global sleep quality, PSS-10= perceived stress.



(a)



(b)

*p<.05, **p<.01, *** p<.001

Figure 1.

Mediation Paths for Perceived Stress (a) and Exercise Related Energy Expenditure (b).

†change from baseline to post-treatment

CHAPITRE V

DISCUSSION

Ce projet de doctorat s'inscrit dans un essai clinique randomisé plus vaste évaluant l'utilité d'un programme supervisé d'exercices faits à la maison dans le traitement de la dépression post-partum. La prévalence de la fatigue en post-partum est élevée. De plus, il s'agit d'un phénomène persistant qui peut avoir un impact sur le pronostic de la dépression, le statut fonctionnel de la mère et sur la dyade mère-enfant. Il est donc étonnant qu'à ce jour, seulement deux études aient évalué des interventions visant à réduire la fatigue durant le post-partum. Utilisant une conception multidimensionnelle de la fatigue, les buts de la présente thèse étaient:

1) Premièrement, d'évaluer l'efficacité d'un programme supervisé d'exercices physiques de 12 semaines, fait à la maison, pour diminuer la fatigue physique et mentale chez des femmes déprimées en post-partum.
2) Déterminer quels sous-groupes de femmes déprimées en post-partum montreront les plus grandes améliorations dans les dimensions physique et mentale de la fatigue grâce à l'exercice et d'étudier les mécanismes par lesquels ces effets bénéfiques se produisent.

Efficacité de l'intervention

Cette étude est le premier essai clinique randomisé qui examine les effets de l'exercice en tant qu'intervention pour la fatigue post-partum. Après avoir complété les 12 semaines du programme supervisé d'exercices à la maison, il y a eu une réduction statistiquement significative sur toutes les sous-échelles MFI-20 à l'exception de la fatigue mentale. La réduction significative de la fatigue physique s'est maintenue à 3 mois post-traitement alors que pour la réduction de la fatigue mentale seule une tendance statistique a été observée. Schwartz et al., (2002) fournissent des lignes directrices empiriques de standards minimaux pour évaluer l'importance clinique des réductions de fatigue. En accord avec ces lignes directrices, un changement de 0.8 par item d'échelle pourrait être considéré comme étant cliniquement significatif. En d'autres mots, en ce qui concerne les sous-échelles de fatigue physique et mentale du MFI-20, un changement de 3.2 et plus peut être

indicateur d'une différence significative au plan clinique. Après examen des moyennes non-ajustées, en post-traitement, le groupe d'exercice a montré une réduction cliniquement significative à toutes les sous-échelles MFI-20 exception faite de la fatigue mentale et de la motivation réduite. Par ailleurs, les changements dans le groupe contrôle ne se sont pas approchés du seuil indicatif d'une différence clinique importante. Des résultats similaires ont été observés à 3 mois post-traitement. Il est important de noter qu'à 3 mois post-traitement, le changement de la moyenne pour la fatigue mentale dans le groupe d'exercice était de 3.39, alors que le changement dans le groupe contrôle reste bien en dessous du seuil suggérant une différence cliniquement significative.

Après le contrôle statistique des scores de niveau de base, pour la fatigue, la sévérité de la dépression initiale, la forme physique initiale et le temps écoulé depuis l'accouchement, le groupe exercice a connu une plus grande réduction de la fatigue physique en post-traitement comparativement au groupe contrôle. À 3 mois post-traitement, le groupe exercice affichait aussi une plus grande réduction de la fatigue physique. De plus, au niveau des analyses basées sur le principe d'efficacité, les différences entre les deux groupes sont demeurées statistiquement significatives à 3 mois post-traitement. Nos résultats sont conformes aux études précédentes qui montraient des améliorations de la fatigue grâce à l'exercice (Puetz et al., 2006), généralisant ainsi les bénéfices aux femmes déprimées en post-partum. La taille de l'effet de 0.58, observée en post-traitement est plus grande que celle rapportée pour la fatigue dans la méta-analyse récente sur l'intervention par l'exercice (0.41) (Puetz et al., 2006).

Les analyses ajustées par les covariables ont révélé des changements non statistiquement significatifs au niveau de la fatigue mentale suite à l'exercice. Au suivi de trois mois, une tendance statistique a révélé une plus grande réduction de la fatigue mentale dans le groupe d'intervention. D'autres analyses ont montré que les améliorations des scores de la fatigue mentale étaient en fonction des valeurs des fatigues mentale et physique à l'entrée dans l'étude. En effet, les femmes rapportant

peu de fatigue physique à l'entrée dans l'étude ont montré des réductions de la fatigue mentale, et ce, possiblement parce qu'elles étaient portées à participer davantage au programme d'exercice physique. Par ailleurs, les femmes ayant un score élevé sur la fatigue mentale à l'entrée dans l'étude, ont montré une diminution significative, mais marginale, à 3 mois post-traitement. Ce résultat juxtaposé à celui d'une plus grande diminution observée à 3 mois post-traitement au niveau des analyses d'efficacité suggèrent qu'une augmentation de la durée des programmes pourrait être nécessaire afin d'observer des réductions de la fatigue mentale. La sous-échelle de fatigue mentale du MFI-20 mesure les difficultés de concentration et la capacité de diriger ou de maintenir son attention. Des études antérieures ont démontré que l'exercice améliore des fonctions cognitives telles que le temps de réponse mentale, la planification, le monitorage et la coordination des tâches (Hillman et al., 2006; Weuve et al., 2004). Les mécanismes responsables de tels bénéfices ne sont pas encore connus. Les types d'exercices les plus fréquemment rapportés par les femmes dans les modalités d'intervention nécessitaient peu d'attention ciblée (par exemple la marche, la course), ce qui suggère que ce type d'exercices est possiblement plus réparateur pour les femmes fatiguées mentalement.

Les conceptualisations de la fatigue utilisées dans les études expérimentales en post-partum sont variées et font rarement de distinctions claires entre les dimensions physique et mentale de la fatigue (e.x., Thome & Adler, 1999; Troy & Dalgas-Pelish, 2003). Les résultats actuels mettent en évidence l'importance de mesurer les multiples dimensions de la fatigue étant donné qu'elles répondent différemment au traitement. Cela est conforme aux études sur l'exercice employant des mesures multidimensionnelles de la fatigue et qui montrent des bénéfices différentiels. Par exemple, on a montré que le yoga diminue la fatigue générale telle que mesurée par le MFI-20 mais n'a aucun effet sur d'autres dimensions précises de la fatigue (Oken et al., 2004). Dans une autre étude avec des patients présentant de la fatigue chronique, il a y eu une réduction de la fatigue physique avec l'exercice, mais pas de la fatigue mentale (Fulcher & White, 1997).

En tenant compte du contexte du post-partum, le niveau minimum d'exercices physiques recommandé par le *American College of Sports Medicine* (1998) (c.-à-d. 60 minutes d'activités cardiovasculaires par semaine) a été choisi pour définir l'observance au programme. Basé sur cette définition, 76.1% des participantes ont été observantes au programme d'exercices, avec une moyenne de 124.09 min./semaine (*ET* = 96.33) d'activités cardiovasculaires, comparativement aux femmes du groupe contrôle qui ont rapporté une moyenne de 54.6 minutes (*ET* =55.8) par semaine, pendant la période de 12 semaines. Le taux d'observance est semblable à celui rapporté dans d'autres études qui ont utilisé des interventions d'exercices faits à la maison (c.-à-d. 72 %) (Mock et al., 2005). Des niveaux modérément élevés d'observance sont cliniquement pertinents si on considère que moins de la moitié des femmes rapportent faire de l'activité physique dans leur temps de loisirs (Statistiques Canada, 2006). Des études transversales suggèrent que les évènements liés à la naissance de l'enfant et aux besoins de la famille peuvent partiellement expliquer le faible taux d'activités physiques chez les femmes. Ces études démontrent que les femmes qui ont des enfants ont significativement moins tendance à s'engager dans des activités physiques dans leur temps de loisirs (Sharff, Homan, Kreuter, & Brennan, 1999). En outre, une prévalence élevée de fatigue a été notée chez les mères, mais pas chez les pères (Bensing, Hulsman, & Schreurs, 1999). De plus, la disponibilité que doit fournir la mère pour les soins des enfants est une des barrières à l'exercice la plus fréquemment citée (Albright, Maddock, & Nigg, 2005; Nies, Vollman, & Cook, 1999). Durant le post-partum, le format de programme d'exercices à domicile pourrait donc aider à surmonter des barrières potentielles à l'exercice.

Variables modératrices

La recherche de variables modératrices et médiatrices des effets de l'exercice sur les dimensions physique et mentale de la fatigue a été guidée par l'approche biopsychosociale. On a fait l'hypothèse que les facteurs reliés à l'accouchement, ainsi

que des facteurs psychosociaux et comportementaux pouvaient influencer les changements au niveau des dimensions physique et mentale de la fatigue suite à l'exercice.

En ce qui concerne les variables modératrices de l'effet des exercices supervisés à domicile sur la fatigue physique, les femmes qui commencent à s'entraîner après approximativement 9 semaines post-accouchement et celles avec une meilleure condition physique cardiovasculaire ont montré de plus grandes réductions de la fatigue physique grâce à l'exercice. La sévérité de la dépression au moment de l'entrée dans l'étude n'a pas influencé les effets de l'exercice sur la fatigue physique.

Les analyses des variables modératrices des changements au niveau des dimensions mentales de la fatigue ont montré que l'intervention était plus efficace pour les femmes qui sont entrées dans l'étude à 9 semaines post-accouchement que pour celles entrées plus tôt. Les femmes du groupe exercice ayant des scores de dépression élevées au niveau de base ont montré des améliorations significatives sur les dimensions mentales de la fatigue comparativement à celles qui étaient moins déprimées. Des tendances statistiques ont été observées pour la parité et le mode d'accouchement suggérant que les femmes multipares et celles qui ont accouché par voie vaginale présenteraient plus d'améliorations au niveau de la fatigue mentale grâce à l'exercice que les autres.

L'effet différentiel de la sévérité de la dépression au niveau de base sur les dimensions physique et mentale de la fatigue est aussi à souligner. Il a déjà été suggéré que la fatigue et la dépression sont des états qui se superposent et qui partagent des mécanismes sous-jacents similaires (Mohr, Hart, & Goldenberg, 2003). Les résultats de la présente étude offrent un appui partiel à cette hypothèse en ce qui concerne la dimension mentale de la fatigue. Cela concorde avec les études récentes employant une mesure multidimensionnelle de la fatigue montrant une association significative entre la dépression et la dimension mentale de la fatigue, mais non avec la fatigue physique (Lim, Hong, Nelesen, & Dimsdale, 2005).

Variables médiatrices

Il y a peu de connaissances empiriques quant aux mécanismes par lesquels l'exercice influence la fatigue. Le fait que la fatigue peut être la manifestation d'un symptôme associé à une diversité de problèmes physiques et psychiatriques complique la recherche des mécanismes, par le fait que ces mécanismes peuvent être associés à de maladies spécifiques (Lange, Cook, & Natelson, 2005). Il y a plusieurs évidences qui suggèrent que des réductions de la norépinéphrine et de la dopamine sont associées aux symptômes de fatigue, à un faible niveau d'énergie et à une perte de motivation (Stahl, 2002). Des études ont démontré que l'exercice physique augmente les niveaux de norépinéphrine, sérotonine et de dopamine (Dishman et al., 2006). Cependant, la relation entre la fatigue et des changements dans ces neurotransmetteurs suite à l'exercice physique n'a pas encore été évaluée. L'étude actuelle n'a cependant pas été conçue pour évaluer le rôle de ces mécanismes dans la fatigue post-partum.

Parmi les variables médiatrices potentielles explorées dans cette étude, une réduction dans le stress perçu grâce à l'exercice a eu un effet médiateur partiel sur la réduction de la fatigue physique. Le cerveau et le corps réagissent au stress perçu par une activation de l'axe adrénergique hypothalamo-pituitaire et le système sympathique prépare le corps à « se battre ou se sauver » (Tsatsoulis & Fountoulakis, 2006). Il est par conséquent biologiquement plausible que la diminution du stress perçu grâce à l'exercice puisse amener une réduction de la fatigue physique, du fait que les ressources du corps sont mises à l'épreuve moins souvent. De plus, on a montré que l'exercice atténue les réponses neuroendocrinologiques dues au stress (Blumenthal, et al., 1990; Crews & Landers, 1987). En d'autres termes, en présence de stress psychologique, chez la personne qui fait de l'exercice, le corps a une réponse neurophysiologique moins intense, contribuant possiblement à une réduction de la fatigue physique perçue. Par un accroissement de la composante de réduction

du stress dans un programme d'exercices on pourrait en améliorer les effets sur la fatigue physique et aussi augmenter la participation à l'exercice (Urizar et al., 2005).

Les diminutions de la fatigue physique sont aussi partiellement expliquées par le niveau de dépense énergétique relié à l'exercice. En post-traitement, le niveau de dépense énergétique hebdomadaire était 57% plus élevé dans le groupe exercice comparativement au groupe contrôle. La relation dose-réponse entre l'exercice et la réduction de la fatigue n'a cependant pas encore été étudiée. Toutefois, les études chez les patients déprimés ont montré que la dépense énergétique totale est un important prédicteur de rechute ou de rémission (Dunn, Trivedi, Kampert, Clark, & Chambliss, 2005).

Malgré cette augmentation significative dans la dépense énergétique reliée à l'exercice, il n'y a pas d'association significative entre l'intervention et les changements dans la condition physique telle que mesurée par le nombre de METS accomplis lors de l'épreuve d'effort cardiovasculaire. Cela suggère que même si le niveau de dépense énergétique a eu un effet médiateur partiel sur la diminution de la fatigue, ces bienfaits ne sont pas nécessairement accompagnés d'un changement significatif au niveau de la forme physique. En autres mots, une augmentation du niveau d'activité en post-partum chez les femmes déprimées peut effectivement atténuer la fatigue physique même en l'absence d'effets significatifs sur la condition cardiorespiratoire. Même si Fulcher et White (1997) rapportent une amélioration de la condition cardiorespiratoire et une diminution de la fatigue chez les patients souffrants de fatigue chronique, ils n'ont pas évalué si la diminution de la fatigue était associée à l'amélioration de la condition cardiorespiratoire. Des essais randomisés contrôlés de programmes d'exercices chez des populations déprimées suggèrent que les bénéfices ne sont pas liés à l'amélioration de la condition cardiovasculaire (King, Taylor, & Haskell, 1993).

Fatigue en contexte de dépression

La dépression post-partum se produit chez 10-16% des femmes (Cox et al., 1993). La fatigue est un des symptômes physiques de dépression le plus fréquemment auto rapporté (Tylee et al., 1999). De plus, les femmes ont elles-mêmes plus tendance à rapporter des symptômes dépressifs qui incluent des symptômes somatiques (perturbations du sommeil, fatigue, problèmes d'appétit) comparativement aux hommes (Silverstein, 2002). Ainsi, durant le post-partum, il a été montré que les femmes ont plus tendance à exprimer des symptômes somatiques de dépression à 6 et 16 semaines post-partum plutôt que des émotions de tristesse (Ross, Evans, Sellers, & Romach, 2003).

Des études empiriques démontrent que la fatigue ne répond pas rapidement aux médicaments antidépresseurs ou aux traitements psychothérapeutiques de la dépression (Barkhman et al, 1996; Nierenberg et al, 1999). Ces résultats suggèrent que la fatigue est un symptôme de dépression résistant au traitement et pourrait être un meilleur prédicteur d'une évolution chronique de la dépression que les émotions de tristesse (Moss & Cronkite, 1999). Les études épidémiologiques longitudinales dans la population en général et les études sur la fatigue post-partum appuient l'existence d'une relation bidirectionnelle entre la dépression et la fatigue, dans laquelle la dépression prédit la fatigue et la fatigue prédit la dépression (Addington et al., 2001; Dennis & Ross, 2005). Même s'il y a déjà de nombreuses spéculations sur le rôle des effets sédatifs de certaines classes d'inhibiteurs sélectifs de la capture de la sérotonine, les mécanismes précis à travers lesquels la fatigue agit sur l'évolution de la dépression et vice versa sont inconnus (Nierenberg et al., 1999).

Dans le cadre de l'approche cognitivo-béhaviorale, il est possible de débattre que la fatigue, par définition, est associée à une diminution d'activités physiques et mentales limitant ainsi l'opportunité d'entreprendre des activités agréables (Jacobson, Martell & Dimidjian, 2001; Lewinson & Graf, 1973). Une fatigue mentale sévère peut également limiter les capacités de résolution de problèmes (Nezu, 1989). Par ailleurs, les femmes déprimées en post-partum peuvent être plus portées à interpréter

une fatigue normale en termes négatifs ou de manière catastrophique menant à de la détresse psychologique et à d'autres restrictions des activités physiques (e.x., Jacobsen, Andrykowski, & Thors, 2004; Willoughby, Hailer, Mulkana, & Rowe, 2002). Plus la fatigue et l'humeur dépressive persistent, plus les femmes restreignent les activités physiques et mentales. L'exercice physique fournit donc un moyen d'interrompre la boucle entre la dépression et la fatigue. Les résultats de l'essai clinique actuel amènent un appui à cet argument en démontrant que l'exercice diminue la dépression et la fatigue (Da Costa et al., soumis).

Implications cliniques

Même si la fatigue est un des symptômes les plus fréquemment rencontrés en soins primaires (Lange et al, 2005), les médecins sont souvent devant un vide en ce qui a trait aux interventions efficaces. En post-partum, les exercices faits à la maison constituent une méthode valable pour atténuer la fatigue chez les femmes déprimées. Au premier abord, il peut sembler paradoxal à la fois aux nouvelles mères et aux professionnels de la santé de recommander l'exercice aux femmes déprimées et fatiguées, alors que dans une approche conventionnelle le remède serait de suggérer plus le repos. Les obstétriciens-gynécologues et les infirmières assurant le suivi post-partum et qui sont confrontés aux patientes fatiguées peuvent recommander l'exercice comme méthode de gestion de la fatigue. Les professionnels de la santé doivent être conscients des manifestations physiques et mentales de la fatigue, car ces dernières répondent différemment aux interventions basées sur l'exercice. Nos résultats suggèrent, qu'en post-partum, l'exercice est efficace pour atténuer la fatigue physique chez la femme déprimée. C'est aussi un moyen efficace pour réduire la fatigue mentale, lorsque débuté autour de 9 semaines post-accouchement, chez les femmes qui rapportent peu de fatigue physique et aussi chez celles qui ont des humeurs dépressives plus sévères. De plus, ce programme d'exercices supervisés faits à la maison s'est montré efficace pour atténuer les humeurs dépressives (Da Costa et al., soumis). Souvent, les patients déprimés ne vont pas chercher un traitement en raison

de la stigmatisation sociale qui lui est associée (Barney, Grifiths, Jorm, & Christensen, 2006). La peur de la stigmatisation sociale peut être plus fréquente durant le post-partum, une période où les émotions de dépression et de fatigue sont incompatibles avec les réponses de joies attendues (Dennis & Chung-Lee, 2006). Les exercices physiques ont une influence à la fois sur la fatigue et la dépression et de ce fait, possiblement améliorent le pronostic de dépression en évitant le problème de la stigmatisation sociale associée.

Les informations concernant la prévalence de la fatigue et sa persistance durant le post-partum, tout comme les informations sur les bénéfices de l'exercice, peuvent être utilisées de manière préventive par de l'enseignement donné aux femmes durant leur grossesse. Cette information peut être diffusée dans le contexte de groupes prénataux, au moment des visites chez le médecin, à travers une communication verbale ou sous forme de feuillet d'informations.

Le format « à domicile » du programme d'exercices peut aider à diminuer les barrières à la participation telle que l'accès aux centres d'entraînement, les coûts des programmes d'exercices en groupe, et les problèmes de garde des enfants.

Même en utilisant les faibles niveaux des recommandations de *American College of Sports Medicine* (1998) pour l'activité physique, l'intervention est efficace pour diminuer les dimensions physique et mentale de la fatigue chez les femmes déprimées. Savoir que des investissements de coûts et de temps importants ne sont pas nécessaires pour produire des bénéfices peut encourager les femmes à commencer de faire l'exercice.

Partage des connaissances

Dans un premier temps les obstétriciens/gynécologues, les infirmières de CLSC, et les infirmières rattachées aux centres de naissances qui ont participé au recrutement de notre échantillon recevront un résumé de nos résultats par écrit. Par la suite, nous contacterons ces mêmes collaborateurs afin d'évaluer leurs intérêts à

recevoir une présentation orale d'une heure sur les résultats de l'étude. Ces présentations permettront un dialogue avec des intervenants de première ligne qui contribuera au raffinement de notre plan de partage de connaissance (ex. quel est le moyen le plus efficace pour communiquer nos résultats à d'autres obstétriciens/gynécologue). Lors des présentations dans les centres de naissances, des démarches pour inclure un feuillet d'informations portant sur la fatigue et l'exercice dans les documents remis aux mères suite à la naissance seront discutées avec les infirmières responsables. Lors des présentations dans les CLSC la possibilité de présenter les résultats lors des cours prénataux sera explorée.

Dans un deuxième temps, nous communiquerons avec l'association des gynécologues/obstétriciens du Québec afin de discuter de la possibilité de diffuser les résultats de notre recherche sur leur site internet. Les médecins intéressés à obtenir des feuillets d'informations pour distribuer à leurs patientes seront invités à communiquer avec notre laboratoire.

Lorsque nous avons lancé le projet, les médias avaient invité le Docteur Da Costa à participer à des reportages télévisés et des entrevues pour des articles de quotidiens montréalais. Ces médias ont manifesté un intérêt à diffuser les résultats du projet plus vaste suite à leurs publications. L'utilisation de ces moyens de partage permettra de rejoindre un public plus vaste et de caractéristiques démographiques variées.

Forces et limites

Il s'agit du premier essai randomisé contrôlé évaluant l'efficacité de l'exercice comme intervention pour atténuer la fatigue durant le post-partum. La répartition aléatoire des sujets dans le groupe expérimental et dans le groupe contrôle maximise les chances d'obtenir des groupes équivalents au pré-test et minimise les menaces à la validité interne (Cook & Campbell, 1979). Malgré ces avantages, des désavantages tels qu'une compétition compensatoire des participantes dans le groupe contrôle peuvent causer une réduction des différences attendues (Cook & Campbell, 1979). Pour des raisons éthiques, on ne pouvait interdire aux femmes dans le groupe contrôle

de faire de l'exercice, cependant pour contrôler cela, les niveaux d'activités physiques dans les deux groupes étaient mesurés. D'autre part, un découragement dû à la déception d'être dans le groupe contrôle peut aussi apparaître chez ces sujets. Afin de minimiser cette possibilité, le formulaire de consentement expliquait clairement que les bénéfices de l'exercice en post-partum n'étaient pas encore scientifiquement prouvés. Cela a été aussi re-spécifié par l'assistant de recherche au moment du recrutement.

Cette étude n'incluait pas de groupe contrôle ne bénéficiant que de l'aspect attention et support inclut dans le programme d'exercice. Les différences observées pourraient donc être attribuables à l'attention du thérapeute responsable du programme d'exercice ou aux attentes des femmes qui anticipaient des bénéfices grâce à l'intervention, ou aux deux. L'effet de médiation partiel de la dépense énergétique reliée à l'exercice favorise l'argument que les améliorations observées au niveau de la fatigue physique n'étaient pas attribuables exclusivement à l'attention portée par le thérapeute ou aux attentes des femmes. Ceci concorde avec les études portant sur l'exercice dans des populations non-déprimées où l'on avait inclus un groupe contrôle bénéficiant de la dimension « attention-support ». Ces études montrent que la quantité d'attention du thérapeute n'est pas responsable de la réduction observée de la fatigue générale et des dimensions physiques de la fatigue (Fulcher & White, 1997 ; Pinto, Frierson, Rabin, Trunzo & Marcus, 2005). Un devis avec un groupe contrôle « attention-support » adéquat pose un défi dans l'évaluation de programmes d'exercices, si l'on considère que des conditions placebo avec éducation et étirement utilisées dans les essais cliniques dans d'autres populations ont produit une réduction des symptômes de fatigue (Puetz et al., 2006).

D'autre part, le fait que rien ne soit connu sur la relation entre la réduction de la fatigue physique et mentale et les changements dans les habiletés à effectuer les tâches quotidiennes associées au rôle de mère constitue aussi une autre faiblesse de la présente recherche. Des études chez d'autres populations montrent une corrélation faible entre des mesures subjectives de fatigue et des mesures objectives des capacités

fonctionnelles (DeLuca, 2005). Cette relation n'a pas encore été explorée chez la femme déprimée en post-partum.

Les analyses portant sur les variables modératrices et médiatrices sont des analyses secondaires avec une faible puissance statistique. Ceci a donc pu accroître la probabilité de l'erreur alpha et de ce fait la possibilité de résultats faussement non significatifs. Les résultats ont besoin d'être reproduits dans des études futures.

Enfin, les participantes étaient fortement scolarisées et volontaires à participer à un essai clinique randomisé portant sur un programme d'exercices faits à la maison. Il n'est pas possible de savoir si les résultats sont généralisables à des populations présentant des caractéristiques différentes. Un niveau de scolarisation faible et l'appartenance à des classes socioéconomiques défavorisées sont associés à des niveaux d'activités physiques plus bas (Crespo, Andersen, Carer-Pokras, & Ainsworth, 2000). De ce fait, il est possible que les mères faiblement scolarisées aient eu moins tendance à être volontaires pour participer et adhérer à l'intervention ce qui limite aussi le pouvoir de généraliser les résultats de la présente recherche.

Orientations futures

Considérant qu'il s'agit de la première étude évaluant une intervention basée sur un programme d'exercices pour atténuer la fatigue post-partum chez les femmes déprimées, les résultats ont besoin d'être reproduits. Les limites quant à la généralisation pourraient être abordées dans des études futures en ciblant d'autres populations comme les mères non-déprimées et des mères qui auraient moins tendance à faire de l'exercice (mères moins scolarisées, mères avec un indice de masse corporelle élevé).

Beaucoup d'études suggèrent que la fatigue est un symptôme qui persiste tout au long de la première année suivant l'accouchement. Cependant, les mesures de fatigue à item unique telles qu'employées dans les études de prévalence apportent peu d'informations sur la sévérité de la fatigue et sur les dimensions mentale et physique

de la fatigue dans la période post-partum. Aussi, il y a peu de données quant aux facteurs qui contribuent à la persistance de la fatigue suivant la naissance de l'enfant.

Il y a un corpus de plus en plus important d'études suggérant que des interventions ciblant des symptômes physiques de dépression telle que la fatigue améliorent la réponse au traitement ainsi que le pronostic (McIntyre et al., 2006). Des études futures seront nécessaires pour déterminer si le fait de s'attaquer à la fatigue physique et mentale grâce à l'exercice peut réduire le risque de chronicité et la rechute chez les femmes déprimées en post-partum.

L'étude actuelle apporte quelques éléments préliminaires suggérant des mécanismes possiblement responsables de la diminution de la fatigue physique grâce à l'exercice. Il sera nécessaire de le confirmer avec des études futures. D'autres variables qui sont reconnues comme affectant la participation à l'exercice et influençant la fatigue, tel que l'indice de masse corporelle, devront aussi être explorées.

Finalement, les bénéfices à long-terme de toute intervention basée sur l'exercice sont tributaires de la poursuite des exercices. Considérant la faible prévalence d'activités physiques rapportées par les femmes, des études futures seront nécessaires pour évaluer les déterminants de l'observance aux programmes d'exercices chez les femmes après la naissance de l'enfant.

Conclusion

Dans une perspective de réduction de la fatigue chez les femmes déprimées en post-partum, les exercices faits à la maison sont peu coûteux et leur implantation est facile. Les résultats actuels indiquent que l'exercice supervisé fait à la maison est efficace pour atténuer la fatigue physique en post-partum, indépendamment de la sévérité des scores de dépression à l'entrée dans l'étude.

L'intervention basée sur l'exercice s'est aussi avérée efficace pour atténuer la fatigue mentale pour un sous-groupe de femmes, plus précisément les femmes déprimées en post-partum qui présentent, peu de fatigue physique initiale, plus de

fatigue mentale, et des humeurs dépressives sévères. Cibler la fatigue peut aider à améliorer le statut fonctionnel maternel et à diminuer le risque de symptômes résiduels de dépression qui pourrait amener une récurrence d'épisodes dépressifs avec des impacts négatifs sur la mère et l'enfant.

APPENDICES

APPENDICE A
FORMULAIRES DE CONSENTMENT

Informed Consent

Title: A Randomized Clinical Trial of Individualized Home-Based Exercise for Women with Postpartum Depression.

Investigators: Dr. Da Costa (with Drs. Lowensteyn, Abrahamowicz, Penrod and Clarke).

1. **Purpose**: The purpose of this study is to test whether the addition of an exercise program can reduce depressive symptoms and improve maternal adjustment for women in the postpartum period.

2. **Procedures**: Participants will be assigned by chance to one of two groups: (1) standard medical care or (2) standard medical care plus a home-based exercise program. Testing will occur on four occasions: (1) baseline i.e., at study entry, (2) 3 months after baseline, (3) 6 months after baseline, and (4) 9 months after baseline. The following tests will occur at:

2a. Baseline: A cardiovascular fitness test (supervised by a physician). Participants will be requested to complete a packet of questionnaires measuring psychosocial well-being (e.g., mood, stress) and health care costs. The cardiovascular fitness test will take approximately 30 minutes, and the questionnaires will be completed at home and returned via the post in pre-

addressed, stamped envelopes. They will take approximately 45 minutes to complete.

2b. First 12 weeks: Following group assignment, participants will be asked to complete brief forms regarding exercise practice, anxiety and mood at weeks 4, 8 and 12 of the study. These forms take approximately 15 minutes each time to fill out. Participants assigned to the exercise group will log exercise weekly for the first 12 weeks. Participants will complete these forms and return them promptly via the mail.

2c. 3 Months following baseline: Participants will undergo a second cardiovascular fitness test. The same questionnaires administered at baseline will be distributed; participants will complete these and return them promptly via the post. Participants will be contacted by the study interviewer to inquire about their current mood. This telephone interview will take approximately 20-30 minutes.

2d. 6 Months following baseline: The same questionnaires administered at baseline will be distributed; participants will complete these and return them promptly via the post. The same telephone interview to inquire about current mood will also occur at this time.

2e. 9 Months following baseline: The same questionnaires administered at baseline will be distributed; participants will complete these and return them promptly via the post. The same telephone interview to inquire about current mood will also occur at this time.

Cardiovascular fitness test: This test will help the study physician to determine if participants can exercise safely. During each exercise stress test, participants will be asked to exercise to the maximum. The test will be terminated when several predetermined endpoints are reached. However, participants are free to end the test at any time.

3. Exercise group - Participants assigned to this group will meet with an exercise specialist on 4 occasions over a 12-week period. The level of exercise that participants will perform as part of the individualised home exercise program will be based upon the individual's physical condition as determined through a graded exercise evaluation (exercise stress test) given at the beginning of the program. Participants will be given exact instructions regarding the amount and kind of exercise that they should do. A heart rate monitor will be loaned to participants in order for them to monitor their exercise intensity level. The exercise program should be followed unless symptoms such as fatigue, shortness of breath, chest discomfort, or similar occurrences appear. At that point, participants will be advised to stop exercising and to inform study personnel of these symptoms.

4. Standard Medical Care Group - Participants assigned to this group will continue to receive the standard medical care prescribed by their doctor.

5. Compensation: Participants will receive $20 to defray travel costs for baseline and the 3-month following baseline assessments ($10.00 per visit). A lottery system will be set up such that each time participants mail back data forms their name will go in a Ahat@. Draws will be made at 3, 6 and 9 months awarding prizes such as movie passes and restaurant gift certificates. The program will be provided free of charge. Usually, this exercise program costs $300. All medical evaluations, including the exercise stress test (which costs $150 per test) will be provided free of charge. At the end of the study, a grand prize of inscription fees for an exercise class will be paid for one participant, selected by chance.

6. Potential Benefits: Participation in this research project may or may not affect depressed mood. Generally exercise is associated with decreasing the risk of heart disease, diabetes, high blood pressure, obesity, depression, and colon cancer. It can also improve heart and lung fitness, lower triglycerides, raise HDL (good) cholesterol, improve mood and sleep, reduce anxiety, and improve life expectancy. At the end of the study, each participant will be provided with the results of their fitness tests.

7. **Potential Risks**: To the best of my knowledge, I have no contraindications to exercise. All risks associated with exercise will be minimised by having an exercise stress test to evaluate my physical fitness prior to the study. This test is considered safe. However, on very rare occasions, it my result in abnormal heart rhythms, fainting, or heart attacks. It may involve an extremely remote possibility of death (1 or fewer deaths per 10,000 tests). If abnormal results are found, I will be advised accordingly. In addition, prior to the study, I will obtain clearance from my obstetrician in writing indicating that I can exercise safely. The exercise program will be directed by a professional exercise physiologist and will be adapted to my general physical fitness, in order to minimise risks.

8. Confidentiality: All data collected will be kept confidential by using a code number such that only the study investigators can link names to codes. Data will be stored in a locked file. Research records can be reviewed by the MUHC, the Jewish General, and the Institutional Review Board, Faculty of Medicine, McGill University ethics committees to monitor compliance with hospital regulations. The results of the study may be used for scientific purposes such as publication in a scientific journal or presentation at a scientific meeting. You will NOT be identified as a participant in the study.

I realise that I am free to participate or not in this study. If I refuse to participate, or if I withdraw my participation during the project, I understand that this will not influence the care and treatments that I receive from my doctors.

I understand that if the results of the stress test indicate that it is not safe for me to participate in an exercise program I will be excluded from this study but will continue to receive the standard medical care which my doctor prescribed.

I understand that if I become pregnant during the study, I **must** notify Dr. Da Costa (514) 937-6011, Ext. 4723. If pregnancy is confirmed, you will be withdrawn from the study and if you are in the exercise group you will asked to stop the exercise program.

I agree to participate in the research study described above. My questions have been answered and I understand what is involved in the study. I will receive a copy of this consent form.

Should I have any questions concerning this study, I may call Dr. Da Costa at (514) 937-6011, Ext. 4723. Should I have any questions regarding my rights, I may call Mr. Glen Fash, Representative from the Patient Committee at 937-6011, Ext. 2409.

Name of the participant (print)	Signature of participant	Date

Name of witness (print)	Signature of witness	Date

TO BE SIGNED BY THE RESEARCH ASSISTANT

To the best of my ability, I have fully explained to the subject the nature of this research study. I have invited questions and provided answers. I believe that the subject fully understands the complications and voluntary nature of the study.

Name of the research assistant (print)	Signature of research assistant

Date

Formulaire de consentement éclairé

Titre: Essai clinique randomisé d'un programme d'exercices à domicile individualisé chez des femmes atteintes de dépression postpartum.

Investigateurs: Dr. D. Da Costa (accompagnée des docteurs Lowensteyn, Abrahamowicz, Penrod et Clarke).

1. Objet: L'objet de cette étude es d'évaluer si l'ajout d'un programme d'exercices peut contribuer à réduire les symptômes de la dépression et améliorer l'adaptation des femmes dans la période postpartum.

2. Marche à suivre: Les participantes seront assignées au hasard à l'un de deux groups: (1) soins médicaux usuels ou (2) soins médicaux usuels et programme d'exercice à domicile. Les tests auront lieu à quatre occasions: (1) tests initiaux à l'entrée dans l'étude; (2) 3 mois après les tests initiaux; (3) 6 mois après les tests initiaux; et (4) 9 mois après les tests initiaux. Les tests suivants auront lieu à:

2a. Tests initiaux: Un test d'épreuve d'effort (sous la supervision d'un médecin). La participantes devront compléter une série de questionnaires visant à mesurer le bien-être psychosocial (e.g., humeur, stress) et les coûts auprès du système de la santé. Le test d'épreuve d'effort prendra environs 30 minutes et les questionnaires peuvent être complétés à la maison et retournés par la poste à l'aide d'enveloppe affranchies fournies. Les questionnaires prennent environs 45 minutes à compléter.

2b. Premières 12 semaines: Après avoir été assignées à leur groupe, les participantes devront compléter de brefs formulaires concernant leur pratique d'exercice, l'anxiété et l'humeur aux semaines 4, 8 et 12 de l'étude. Ces formulaires prennent environs 15 minutes à compléter. Les participantes dans le groupe d'exercice devront noter leurs exercices de façon hebdomadaire pour les 12 premières semaines. Ces

formulaires devront être complétés et retournés rapidement par la poste.

2c. 3 mois après les test initiaux: Les participantes devront passer une deuxième épreuve d'effort. Les mêmes questionnaires que ceux remplis lors des tests initiaux seront distribués; les participantes devront les compléter et les retourner rapidement par la poste. Elles seront contactées par l'entrevueuse de l'étude qui s'informera de leur humeur actuelle. L'entrevue téléphonique aura une durée d'environs 20 à 30 minutes.

2d. 6 mois après les tests initiaux: Les mêmes questionnaires que ceux remplis lors des tests initiaux seront distribués; les participantes devront les compléter et les retourner rapidement par la poste. La même entrevue téléphonique aura lieu à ce moment pour s'informer de leur humeur actuelle.

2e. 9 mois après les tests initiaux: Les mêmes questionnaires que ceux remplis lors des tests initiaux seront distribués; les participantes devront les compléter et les retourner rapidement par la poste. La même entrevue téléphonique aura lieu à ce moment pour s'informer de leur humeur actuelle.

Épreuve d'effort: Ce test permettra au médecin de l'étude de déterminer si les participantes peuvent faire de l'exercice de façon sécuritaire. Pendant chaque épreuve d'effort, les participantes devront faire de l'exercice à leur capacité maximale. Ce test prendra fin lorsque des stades prédéterminés seront atteints. Cependant, les participantes sont libres d'y mettre fin n'importe quand.

3. Groupe du programme d'exercices - Les participantes assignées à ce group rencontrerons un(e) spécialiste de l'exercice à 4 reprises sur une période de 12 semaines. Le niveau d'exercices que les participantes auront à exécuter pendant leur programme individuel d'exercices à domicile sera basé sur la condition physique de l'individu telle que déterminée par l'évaluation d'exercices gradués (l'épreuve d'effort) subi au début du programme. Les participantes recevront des directives précises sur la quantité et le type d'exercices qu'elles devront faire. Un moniteur de rythme cardiaque leur seront prêté afin qu'elles puissent vérifier l'intensité de leurs exercices.

Le programme d'exercices devra être exécuté à moins que ne surviennent des symptômes tels que la fatigue, l'essoufflement, l'inconfort à la poitrine ou d'autres du

même genre. Dans un tel cas, on leur avisera de mettre fin aux exercices et d'informer le personnel de l'étude de l'apparition de ces symptômes.

4. **Groupe des soins usuels** - Les participantes assignées à ce groupe continuerons de recevoir les soins usuels prescrits par leur médecin.

5. Dédommagement: Les participantes recevront $20 afin de couvrir leur frais de transport lors des visites initiale et de 3 mois ($10.00 par visite). Un système de loterie sera mis sur pied de façon à ce que chaque fois que les participantes retrournent des formulaires par la poste, leur nom sera mis dans un "chapeau". Des tirages de prix tels que laissez-passer pour le cinéma ou certificats cadeaux de restaurants seront effectués à 3, 6 et 9 mois. Le programme d'exercices qui coûte habituellement $300 sera fourni gratuitement. Toutes les évaluations médicales et les épreuves d'effort qui coûtent $150 chacune seront fournies gratuitement. À la fin de l'étude, on fera tirer comme grand prix les frais d'inscription pour une personne à une classe d'exercices.

6. Bénéfices potentiels: Il se peut que la participation à ce projet de recherche n'ait pas d'effet sur l'humeur dépressive postpartum. En général, la pratique de l'exercice est associée à une dimunition du risque de maladie cardiaque, de diabète, d'hypertension artérielle, d'obésité, de dépression et de cancer du côlon. Ça peut également améliorer les capacités cardiovasculaire et pulmonaire, réduire les triglycérides, augmenter le cholestérol HDL (bon cholestérol), améliorer l'humeur et la qualité du sommeil, réduire l'anxiété et enfin, améliorer l'espérance de vie. À la fin de l'étude, chaque participante recevra les résultats de ses épreuves d'effort.

7. Risques probables: En autant que je sache, je ne crois pas avoir de contre-indications à l'exercice. Tous les risques associés à l'exercice seront minimisés par l'exécution d'une épreuve d'effort avant mon entrée dans l'étude pour évaluer ma forme physique. Ce test est reconnu comme étant très sécuritaire. Cependant, en de très rares occasions, il peut en résulter un rythme cardiaque anormal, un évanouissement ou une crise cardiaque. Il existe également une infime possibilité de décès (1 ou moins sur 10,000). Si j'obtiens des résultats anormaux, je serai avisée immédiatement. De plus, avant mon entrée dans l'étude, j'obtiendrai par écrit l'approbation de mon obstétricien(ne) comme quoi je peux faire de l'exercice en toute sécurité. Le programme d'exercices sera supervisé par une physiologiste de l'exercice professionnelle et sera adapté à ma condition physique générale de façon à réduire les risques au minimum.

8. Confidentialité: Toutes les données recueillies demeureront strictement confidentielles par l'usage d'un système de codes numérique de façon à ce que seuls les investigateurs de l'étude puissent relier les noms aux codes numériques. Les données seront conservées dans un classeur verrouillé. Les données de l'étude

peuvent être révisées par les comités d'éthique du CUSM, de l'hôpital général juif et le "Institutional Review Board", faculté de médecine, université McGill afin d'assurer l'observance des règles institutionnelles. Les résultats de l'étude peuvent être utilisés à des fins scientifiques telles que publications d'articles dans des revues scientifiques ou présentations orales lors de conférences scientifiques. Vous NE serez PAS identifiée en tant que participante à cette étude.

Je reconnais que je suis libre de participer à cette étude. Mon refus de participer ou mon retrait en cours d'étude n'influenceront en rien les soins ou traitements que je recevrai de mes médecins.

Je comprends que si les résultats de l'épreuve d'effort indiquent que ma participation à un programme d'exercices n'est pas sécuritaire, je serai exclue de cette étude. Cependant, je continuerai de recevoir les soins médicaux usuels prescrits par mon médecin.

Je comprends que si je deviens enceinte lors de l'étude je **dois** en aviser Dr. Da Costa (514) 937-6011, Ext. 4723. Si la grossesse est confirmée vous serez retirée de l'étude et si vous êtes dans le group d'exercices on vous demandera d'arrêter le programme d'exercices.

J'accepte de participer à l'étude décrite précédemment. Je comprends ce qu'implique cette étude et on a répondu à mes questions. Je recevrai une copie de ce formulaire de consentement.

Si j'ai des questions concernant l'étude, je peux m'adresser au Dr. Da Costa (514) 937-6011, Ext. 4723. Si j'ai des questions concernant mes droits, je peux m'adresser au représentant du comité des bénéficiaires, M. Glenn Fash au (514) 937-6011, Ext. 2409.

Nom de la particpante (majuscules)	Signature de la participante	Date

Nom du témoin (majuscules)	Signature du témoin	Date

À ÊTRE SIGNÉ PAR L'ASSISTANTE DE RECHERCHE

Au meilleur de ma compétence, j'ai expliqué en détails l'étude au sujet et je l'ai invitée à poser des questions auxquelles j'ai répondu. Je crois que le sujet comprend pleinement les implications et le caractère volontaire de sa participation à cette étude.

Nom de l'assistante de recherche (majuscules)	Signature de l'assitante de recherche	Date

APPENDICE B

ENTREVUE SEMI-STRUCTURÉE

DEMOGRAPHICS

In order to determine whether you are eligible to participate in the present study, I will need to ask you some questions pertaining to how you have been feeling since the delivery, some demographic information (e.g. age), your current physical activity level, your general health, your recent pregnancy and your labor/delivery experience.

I. Administer the EPDS.

II. Demographics

1. What is your date of birth: _____
Day Month Year

2. Ethnic Origin: _____Caucasian _____Black _____Asian
_____Native
_____Other(specify):_____

3. Marital Status: _____Single _____Married _____ Co-habiting
_____Separated _____Divorced _____ Widowed

4. How long have you been living with your current partner? (in years)_____

5. What is the highest year of school that you completed? (CIRCLE ONE YEAR)

1 2 3 4 5 6	7 8 9 10 11	12 13 14 15 16 17 >18
Grade School	High School	Specialized Training School
		CEGEP, University

6. What date was your baby delivered? _____ *(note: 4-30 weeks to participate)*

7. Is this your first child?

NO [ ] YES **go to Q8** [ ]

7a. If NO, how many children do you have? _____

7b. How old are each of your other children? _____ _____ _____

8. Are you currently breastfeeding your baby?

NO [ ] YES [ ]

8a. If **"YES"**: Are you only breastfeeding OR are you also using bottle milk?

only breast milk [ ] combination of both [ ]

8b. If **"NO"**: Were you previously breastfeeding? NO [ ] YES [ ]

8c. If **"YES"**: When did you stop? _____

If individual scored 10 or more on the EPDS proceed to part III, if < 10 thank them for their time and explain they are not eligible to participate.

9. How much, in percentage, does your partner contribute to your infant's care? _____%

10. How much, in percentage, does your partner contribute to household chores? _____%

11. Is a family member or friend helping you with your infant's care on a regular basis?

NO [ ] YES [ ]

11a. If '**YES**': How much (in percentage), does your friend/family member contribute to your infants care? _____%

12. Is a friend or family member helping you with your household chores on a regular basis?

NO [ ] YES [ ]

12a. If '**YES**': How much (in percentage), does your family member/friend contribute to household chores? _____%

III. Physical Activity

1. Do you currently engage in physical exercise?

   NO [ ] YES [ ]

2. If yes, what kind of exercise do you do? (e.g. cycling, aerobics, low/high impact aerobics, swimming, walking etc..)_____

3. How many times a week do you exercise? _____

4. How many minutes per exercise session? _____

5. How many weeks after delivering did you start exercise? _____

If Q1 is NO or less than 30 minutes 3 times a week then proceed to Part IV, If =or >

thank them for their time and explain they are not eligible to participate

IV. Medical History (General & Pregnancy related)

1. Do you suffer from any major health problems? NO [ ] YES [ ]

If YES, specify_____

Such as:

_____Heart Disease(HD)	_____ Kidney Disease
_____ Familial History of HD[1]	_____ High Cholesterol (Hypercholesterolemia or low HDL)[2]
_____ Diabetes[3]	_____ Bleeding Disorders
_____ Asthma	_____ Stroke
_____ Rheumatoid Arthritis	_____ High Blood Pressure (Hypertension)[4]

Other (Specify)_____

1 MI or sudden death before 55 years of age in father or other male first-degree relative, or before 65 years of age in mother or other first degree relative.
2 Total serum cholesterol > 200mg/dL (5.2 mmol/L) (if lipoprotein profile is unavailable) or HDL <35 mg/dL (0.9 mmol/L)
3 Persons with insulin dependent diabetes mellitus (IDDM) who are >30 years of age, or have had IDDM for > 15 years, and persons with noninsulin dependent diabetes mellitus (NIDDM) who are >35 years of age should be classified as patients with disease.
4 Blood pressure $\geq$ 140/90mm Hg, confirmed by measurements on at least 2 separate occasions, or on antihypertensive medication. Or low HDL= >60 mg/dL (1.6 mmol/L)

2. Has there been a significant change in your health in the past year?

NO [ ] YES [ ] (specify)_____

3. Are your activities limited by any health problems?

NO [ ] YES [ ] (specify)_____

4. Are you currently taking any prescribed medications?

NO [ ] YES [ ] (specify)_____

5. Have you at any point in the past consulted professional help for any emotional problems?

NO **go to Q8** [ ] YES **go to Q6a** [ ]

a. **If YES**, was that for depression?

NO **go to Q8** [ ] YES [ ]

b. How long ago was this? _____

c. What treatment(s) did you get? (were you hospitalized?) _____

d. Any medications? _____

6. How long did your depression last? _____

7. Have you ever been depressed for a prolonged period of time?

NO [ ] YES (> 2 years?___) [ ]

Now I'm going to ask you about smoking:

8. At the present time do you smoke daily, occasionally, or not at all?
   i. Daily **[go to Q8a]**
   ii. Occasionally **[go to Q8b]**
   iii. Not at all **[go to next section]**

8a. How many cigarettes do you smoke each day now?

_____Number of cigarettes **[go to Q8c]**

8b. How many cigarettes do you smoke in a week?

_____Number of cigarettes **[go to Q8c]**

8c. At what age did you start smoking? _____

Now I'm going to ask you some questions about Alcohol Consumption.

9. During the past 12 months have you had a drink of beer, wine, liquor, or any other alcoholic beverage?

NO **go to Q14** [ ] YES **go to Q10** [ ]

10. **If YES**, during the past 12 months, how often did you drink alcoholic beverages?

a. Less than once a month
b. Once a month
c. 2 to 3 times a month
d. Once a week
e. 2 to 3 times a week
f. 4 to 6 times a week
g. Everyday

11. How often in the past 3 months have you had 5 or more drinks on one occasion

a. Never
b. Less than once a month
c. Once a month
d. 2 to 3 times a month
e. Once a week
f. > 1 a week

12. In the past 12 months, have you ever had such a strong desire or urge to drink alcohol that you could not resist it or could not think of anything else?

NO [ ] YES [ ]

13. In the past 12 months did you ever find you had to drink more alcohol than usual to get the
same effect or that the same amount of alcohol had less effect than usual?

NO [ ] YES [ ]

Now I am going to ask you about your use of Drugs or Medication.

14. Have you ever used any prescribed medication (see drug sheet) or street drugs to get high, to
sleep better, or to change your mood?

NO **go to Q16** [ ] YES [ ]

If YES, What types? _____

14a. **If street drug:** When were you using (drug) the most? _____

14b. Has there ever been a time when you used it at least 10 times in a one-month period
of time?

NO [ ] YES [ ]

15. **If prescribed:** Did you ever get hooked (become dependant) on (prescribed drug) or take much more than was prescribed?

NO [ ] YES [ ]

16. In general would you say your health is:
(READ LIST. MARK ONLY ONE)

a. Excellent
b. Very Good
c. Good
d. Fair
e. Poor

Now I'm going to ask you some questions about your pregnancy.

17. During your pregnancy (most recent) did you experience any of the following complications?

_____ High blood pressure
_____ Gestational diabetes
_____ Pre-eclampsia or toxemia (symptoms: high blood pressure, swelling of face and hands)
_____ Abruptio placentae (partial or complete separation of placenta from wall of the uterus)
_____ Premature contractions resulting in delivery
_____ Other (specify)_____

17. Did you experience any of the following labor/delivery complications?

_____ Cesarean birth
_____ Labor induction
_____ Prolonged labor (specify hours)_____
_____ Forceps delivery
Other (specify)_____

19. Who is your obstetrician/gynecologist? _____

If woman fulfills criteria obtain:

Name: _____

Address: _____ _____
Street City Postal Code

Home Phone: _____ Work Phone: _____

Inform participant that a clinical interviewer will be in contact with them shortly to ask some questions pertaining to their current mood. After that telephone contact, they will be informed if they are eligible to participate

DÉMOGRAPHIQUES

Afin de déterminer si vous êtes éligible à participer à cette étude, je vais devoir vous poser des questions sur la façon dont vous vous sentez depuis l'accouchement. Je vais aussi devoir prendre de l'information démographique (tel que votre âge); vous poser des questions sur votre niveau d'activité physique, sur votre santé en général, sur votre dernière grossesse et sur vos expériences lors du travail et de l'accouchement.

I. Veuillez administrer l'EPDS.

II. Renseignements Démographiques

1. Quelle est votre date de naissance? _____
   Jour Mois Année

2. Origine ethnique : _____Blanc _____Noire _____Asiatique
   _____Amérindien _____Autre(préciser)_____

3. État Civil: _____Célibataire _____Mariée _____Conjoint de fait
   _____Séparée _____Divorcée _____Veuve

4. Depuis combien de temps habitez-vous avec votre conjoint? (années) _____

5. Quelle est la dernière année de scolarité que vous avez complété? (ENCERCLER L'ANNÉE)

1 2 3 4 5 6	7 8 9 10 11	12 13 14 15 16 17 >18
École Primaire	École Secondaire	École de Formation Spécialisée, Cégep, Université

6. Quelle est la date que vous avez accouché de votre bébé? _____
   (note: 4-30 semaines pour pouvoir participer)

7. Est-ce votre premier enfant:

   NON [ ] OUI **passer à Q8** [ ]

   7a. Si NON, combien d'enfants avez-vous? _____

   7b. Quel est l'âge de vos enfants? _____ _____ _____

8. Actuellement est-ce que vous allaitez votre bébé?

NON [ ] OUI [ ]

8a. Si « **OUI** » : Est-ce que vous allaitez exclusivement ou est-ce que vous nourrissez aussi au biberon (fromule).

Juste allaitement [ ] Combinaison des deux [ ]

8b. Si « **NON** » : Est-ce que vous avez déjà allaité votre bébé? OUI [ ] NON]

8c. Si « **OUI** » : Quand est-ce que vous avez arrêté? _____

9. Combien, en pourcentage, est-ce que votre conjoint contribue aux soins de votre bébé?

_____%

10. Combien, en pourcentage, est-ce que votre conjoint contribue aux tâches ménagères ?

_____%

11. Est-ce qu'un membre de votre famille ou un ami vous aide de façon régulière avec les soins de votre bébé ?

NON [ ] OUI [ ]

11a. Si '**OUI**' : Combien en pourcentage, est-ce qu'il/elle contribue aux soins de votre bébé ? _____%

12. Est-ce qu'un membre de votre famille ou un ami vous aide de façon régulière avec les tâches ménagères ?

NON [ ] OUI [ ]

12a. Si '**OUI**' : Combien en pourcentage, est-ce qu'il/elle contribue aux tâches ménagères? _____%

Si la cote de l'EPDS et 10 ou plus, veuillez passer à la section III, si < 10, veuillez les remercier pour le temps qu'elles vont ont accordé et leurs expliquer qu'elles ne sont pas éligibles à participer.

III. Activité Physique

1. Faites-vous actuellement de l'exercice physique?

   NON [ ] OUI [ ]

2. Si oui, quel genre d'exercice faites-vous? (ex. bicyclette, aérobie, natation, marche
   etc.) _____

3. Combien de fois par semaine faites-vous de l'exercice? _____

4. Combien de minutes par session d'exercice? _____

5. Combien de semaines après l'accouchement avez-vous commencé à faire de l'exercice? _____

Si Q1 est NON ou moins que 30 minutes 3 fois par semaine, procédez à la section IV.

Si = ou >, veuillez les remercier pour le temps qu'elles vont ont accordé et leurs expliquer qu'elles ne sont pas éligibles à participer.

IV. Antécédents Médicaux (Généraux et reliés à la Grossesse)

1. Souffrez-vous d'un trouble de santé majeur?

   NON [ ] OUI [ ]

Si OUI, spécifier: _____

Tel que:

_____ Maladies du Coeur (MC)
_____ Histoire Familial de MC [1]
_____ Diabète [3]
_____ Maladies du Sang
_____ Haute Pression [4]
Autre (Spécifier)_____

_____ Maladies du Rein
_____ Haute Cholestérol (ou basse HDL) [2]
_____ Asthme
_____ ACV
_____ Arthrite

1 MI or sudden death before 55 years of age in father or other male first-degree relative, or before 65 years of age in mother or other first degree relative.
2 Total serum cholesterol > 200mg/dL (5.2 mmol/L) (if lipoprotein profile is unavailable) or HDL <35 mg/dL (0.9 mmol/L)
3 Persons with insulin dependent diabetes mellitus (IDDM) who are >30 years of age, or have had IDDM for > 15 years, and persons with noninsulin dependent diabetes mellitus (NIDDM) who are >35 years of age should be classified as patients with disease.
4 Blood pressure ≥ 140/90mm Hg, confirmed by measurements on at least 2 separate occasions, or on antihypertensive medication. Or low HDL= >60 mg/dL (1.6 mmol/L)

2. Y a t'il eu un changement marqué dans votre santé au cours de la dernière année?

NON [ ] OUI [ ]
(spécifier)_____

3. Vos activités sont elles limitées par des problèmes de santé?

NON [ ] OUI [ ]

(spécifier)_____

4. Prenez-vous actuellement des médicaments par ordonnance?

NON [ ] OUI [ ]
(spécifier)_____

5. Avez-vous déjà consulté des services professionnels pour des difficultés personnelles?

NON **passer à Q8** [ ] OUI **passer à Q6A** [ ]

a. **Si OUI**, est-ce que c'était pour une dépression?

NON **passer à Q8** [ ] OUI [ ]

b. Il y a combien de temps de ceci? _____

c. Quel(s) traitement(s) avez-vous reçu? (avez-vous été hospitalisée?)

_____

d. Avez-vous pris de la médication? _____

6. Combien de temps la dépression a t'elle durée? _____

7. Avez-vous déjà été déprimée pour une période de temps importante?

NON [ ] OUI (<2ans? _____) [ ]

Je vais maintenant vous poser des questions sur l'usage du tabac

8. Actuellement, est-ce que vous fumez des cigarettes tous les jours, à l'occasion ou jamais?

i. Tous les jours **[Passer à Q8a]**

ii. À l'occasion **[Passer à Q8b]**

iii. Jamais [Passer à la section suivantes]

8a. Actuellement combien de cigarettes est-ce que vous fumé par jours?

_____ Nombres de cigarettes **[passer à Q8c]**

8b. Actuellement combien de cigarettes est-ce que vous fumé par semaine?

_____Nombres de cigarettes **[passer à Q8c]**

8c. A quel age avez-vous commencé à fumer des cigarettes_____

Je vais maintenant vous poser des questions concernant votre consommation d'alcool.

9. Au cours des 12 derniers mois, avez-vous consommé de la bière, du vin, de la boisson, ou tout
autre breuvage alcoolisé?

NON **passer à Q14** [ ] OUI **passer à Q10** [ ]

10. **SI OUI**, à quelle fréquence avez-vous bu des breuvages alcoolisés au cours des 12
derniers mois?

    a. Moins qu'une fois par mois.
    b. Une fois par mois.
    c. 2 à 3 fois par mois.
    d. Une fois par semaine.
    e. 2 à 3 fois par semaine.
    f. 4 à 6 fois par semaine.
    g. À chaque jour.

11. Au cours des 3 derniers mois, à quelle fréquence avez-vous bu 5 verres ou plus à une
occasion?

    a. Jamais.
    b. Moins d'une fois par mois.
    c. Une fois par mois.
    d. 2 à 3 fois par mois.
    e. Une fois par semaine.
    f. > 1 fois par semaine.

12. Au cours des 12 derniers mois, avez-vous éprouvé un désir ou une envie de boire de l'alcool qui était si fort que vous n'avez pas pu y résister ou que vous n'avez pas pu penser à autre chose?

    NON [ ] OUI [ ]

13. Au cours des 12 derniers mois, avez-vous trouvé que vous aviez à boire plus d'alcool que d'habitude pour avoir le même effet ou que la même quantité d'alcool avait moins d'effet que d'habitude?

    NON [ ] OUI [ ]

Je vais maintenant vous poser des questions concernant votre usage de drogues ou de médications.

14. Avez-vous déjà utilisé de la médication par ordonnance (voir feuille de drogues) ou des drogues de la rue pour être "high", pour vous aider à mieux dormir, ou pour changer votre humeur?

    NON **passer à Q16** [ ] OUI [ ]

SI OUI, quels types de drogues ou de médicaments?_____

14a. **Si des drogues de la rue:** Quand consommiez-vous le plus? _____

14b. Y a t'il eu une période lors de laquelle vous avez consommé au moins 10 fois durant une période d'un mois?

NON [ ] OUI [ ]

15. **Si par ordonnance:** Êtes-vous devenue accrochée (dépendante de la drogue par ordonnance) ou en avez-vous pris plus que la quantité qui était prescrite?

NON [ ] OUI [ ]

16. En générale diriez vous que votre santé est :

(LISEZ LA LISTE. NE COCHEZ QU'UNE SEULE REPONSE.)

a. Excellente
b. Très bonne
c. Bonne
d. Passable
e. Mauvaise

Je vais maintenant vous poser des questions concernant votre grossesse.

1. Au cours de votre grossesse (la dernière), avez-vous eu une des complications suivantes?

_____ Haute pression
_____ Diabète de grossesse
_____ Pré-éclampsie ou toxémie (symptômes: haute pression, gonflement du visage et des mains)
_____ Abruptio placentae (séparation partielle ou complète du placenta des parois de l'utérus)
_____ Contractions prématurées qui ont mené à l'accouchement
_____ Autre (spécifier)_____

2. Au cours du travail et de l'accouchement, avez-vous eu une des complications suivantes?

_____ Césarienne
_____ Provocation de l'accouchement
_____ Travail prolongé (spécifier le nombre d'heures)_____
_____ Accouchement par forceps
_____ Autre (spécifier)_____

19. Qui est votre obstétricien/gynécologue? _____

Si la femme atteint les critères, veuillez compléter les informations suivantes:

Nom: _____

Adresse: _____ _____
Rue Ville Code Postal

Tél à la maison: _____

Tel au travail: _____

APPENDICE C

QUESTIONNAIRES AUTOADMINISTRÉS

Edinburgh Postnatal Questionnaire
Multidimensional Fatigue Inventory
Pittsburgh Sleep Quality Index
Perceived Stress Scale
MOS Social Support Survey
Aerobic Centre Longitudinal Study Physical Activity Questionnaire

Patkey _____ **Date** _____

EDINBURGH POSTNATAL SCALE

Cox, Holden, Sagovsky, University of Edinburgh

As you have recently had a baby, we would like to know how you are feeling. Please indicate the answer which comes the closest to how you have felt IN THE PAST 7 DAYS, not just how you feel today.

IN THE PAST 7 DAYS

1. Have you been able to laugh and see the funny side of things:

_____ as much as I always could
_____ not quite so much now
_____ definitely not so much now
_____ not at all

2. Have you looked forward with enjoyment to things:

_____ as much as I ever did
_____ rather less than I used to
_____ definitely less than I used to
_____ hardly at all

3. Have you blamed yourself unnecessarily when things went wrong:

_____ yes, most of the time
_____ yes, some of the time
_____ not very often
_____ no, never

4. Have you been anxious or worried for no good reason:

_____ no, not at all
_____ hardly ever
_____ yes, sometimes
_____ yes, very often

5. Have you felt scared or panicky for no very good reason:

_____ yes, quite a lot
_____ yes, sometimes
_____ no, not much
_____ no, not at all

6. Have you felt like things have been getting on top of you:

_____ yes, most of the time I haven't been able to cope at all
_____ yes, sometimes I haven't been coping as well as usual
_____ no, most of the time I have coped quite well
_____ no, I have been coping as well as ever

7. Have you been so unhappy that you have had difficulty sleeping:

_____ yes, most of the time
_____ yes, sometimes
_____ not very often
_____ no, not at all

8. Have you felt sad or miserable:

_____ yes, most of the time
_____ yes, quite often
_____ not very often
_____ no, not at all

9. Have you been so unhappy that you have been crying:

_____ yes, most of the time
_____ yes, quite often
_____ only occasionally
_____ no, never

10. Has the thought of harming yourself occurred to you:

_____ yes, quite often
_____ sometimes
_____ hardly ever
_____ never

Échelle d'Edinburgh

Comme vous avez récemment eu un bébé, nous aimerions savoir comment vous vous sentez. Veuillez S.V.P. indiquer la réponse qui vous paraît la plus proche de comment vous vous sentez depuis les DERNIERS 7 JOURS, et non seulement de comment vous vous sentez aujourd'hui.

DANS LES DERNIERS 7 JOURS...

1. Avez-vous été capable de rire et de voir le côté drôle des choses :

____ autant que j'ai toujours pu
____ pas vraiment maintenant
____ définitivement pas autant maintenant
____ pas du tout

2. Avez-vous anticipé avec plaisir les choses :

____ autant que je l'ai toujours pu
____ plutôt moins que je le faisais avant
____ définitivement moins que je le faisais avant
____ presque pas du tout

3. Vous êtes-vous blâmée inutilement quand les choses ont mal été :

____ oui, la plupart du temps
____ oui, quelques fois
____ pas très souvent
____ non, jamais

4. Avez-vous été anxieuse ou inquiète sans aucune bonne raison :

____ non, pas du tout
____ presque jamais
____ oui, des fois
____ oui, très souvent

5. Avez-vous eu peur ou avez-vous paniqué sans aucune bonne raison :

____ oui, beaucoup
____ oui, des fois
____ non, pas beaucoup
____ non, pas du tout

6. Vous êtes-vous sentie dépassée par les choses :

____ oui, la plupart du temps je ne m'en tire pas du tout
____ oui, des fois je ne m'en tire pas aussi bien que d'habitude
____ non, la plupart du temps je m'en tire assez bien
____ non, je m'en tire aussi bien que d'habitude

7. Avez-vous été malheureuse au point d'en avoir de la difficulté à dormir :

____ oui, la plupart du temps
____ oui, assez souvent
____ pas très souvent
____ non, pas du tout

8. Vous êtes-vous sentie triste ou misérable :

____ oui, la plupart du temps
____ oui, très souvent
____ pas très souvent
____ non, pas du tout

9. Avez-vous été si malheureuse que vous en avez pleuré :

____ oui, la plupart du temps
____ oui, assez souvent
____ à l'occasion
____ non, jamais

10. Est-ce que l'idée de vous faire du mal vous a passé par la tête :

____ oui, très souvent
____ des fois
____ presque jamais
____ jamais

Patkey: _____ Date: _____

MFI-20

Instructions:
By means of the following statements we would like to get an idea of how you have been feeling during the past month. There is, for example, the statement :

" I FEEL RELAXED"

If you think that this is entirely true, that indeed you have been feeling relaxed during the past month, please place an X in the extreme left box; like this:

Yes, that is true | X | | | | | No, that is not true

The more you disagree with the statement, the more you can place an X in the direction of "No, that is not true". Please, do not miss out a statement and place one X next to each statement.

1- I feel fit.	Yes, that is true		No, that is not true
2- Physically I feel only able to do a little.	Yes, that is true		No, that is not true
3- I feel very active.	Yes, that is true		No, that is not true
4- I feel like doing all sorts of nice things.	Yes, that is true		No, that is not true
5- I feel tired.	Yes, that is true		No, that is not true
6- I think I do a lot in a day.	Yes, that is true		No, that is not true
7- When I am doing something, I can keep my thought on it.	Yes, that is true		No, that is not true
8- Physically I can take a lot.	Yes, that is true		No, that is not true
9- I dread having to do things.	Yes, that is true		No, that is not true

_____

10- I think I do very little in a day.	Yes, that is true		No, that is not true
11- I can concentrate well.	Yes, that is true		No, that is not true
12- I am rested.	Yes, that is true		No, that is not true
13- It takes a lot of effort to concentrate on things.	Yes, that is true		No, that is not true
14- Physically, I feel I am in a bad condition.	Yes, that is true		No, that is not true
15- I have a lot of plans.	Yes, that is true		No, that is not true
16- I tire easily.	Yes, that is true		No, that is not true
17- I get little done.	Yes, that is true		No, that is not true
18- I don't feel like doing anything.	Yes, that is true		No, that is not true
19- My thoughts easily wander.	Yes, that is true		No, that is not true
20- Physically I feel I am in an excellent condition.	Yes, that is true		No, that is not true

Thank you very much for your cooperation.

Patkey: _____ Date: _____

MFI-20

Directives :
Au moyen des énoncés suivants nous aimerions avoir une idée de la façon dont vous vous sentiez au cours du dernier mois. Par exemple, un des énoncés est :

"JE ME SENS DÉTENDUE"

Si vous estimez que ceci est tout à fait vrai et, qu'en effet, dernièrement vous vous sentiez détendu(e) , placez un X dans la boîte à l'extrême gauche comme ceci:

Oui, c'est vrai						Non, ce n'est pas vrai
	X					

Le plus que vous êtes en désaccord avec l'énoncé, le plus vous pouvez placez le X dans la direction de "Non, ce n'est pas vrai". Veuillez répondre à chaque énoncé et ne placer qu'un seul X par énoncé.

1.	Je me sens en forme.	Oui, c'est vrai					Non, ce n'est pas vrai
2.	Physiquement, je me sens seulement capable d'en faire un peu.	Oui, c'est vrai					Non, ce n'est pas vrai
3.	Je me sens très active.	Oui, c'est vrai					Non, ce n'est pas vrai
4.	J'ai envie de faire toutes sortes de belles choses.	Oui, c'est vrai					Non, ce n'est pas vrai
5.	Je me sens fatiguée.	Oui, c'est vrai					Non, ce n'est pas vrai
6.	Je pense que je fais beaucoup dans une journée.	Oui, c'est vrai					Non, ce n'est pas vrai
7.	Lorsque je suis en train de faire quelque chose, je suis capable de garder mes pensées sur ce que je fais.	Oui, c'est vrai					Non, ce n'est pas vrai
8.	Physiquement, je peux en prendre beaucoup.	Oui, c'est vrai					Non, ce n'est pas vrai
9.	J'appréhende de devoir faire des choses.	Oui, c'est vrai					Non, ce n'est pas vrai

10. Je pense que j'en fais très peu dans une journée.	Oui, c'est vrai	Non, ce n'est pas vrai
11. Je peux bien me concentrer.	Oui, c'est vrai	Non, ce n'est pas vrai
12. Je suis bien reposé(e).	Oui, c'est vrai	Non, ce n'est pas vrai
13. Ça me prend beaucoup d'effort pour arriver à me concentrer sur quelque chose.	Oui, c'est vrai	Non, ce n'est pas vrai
14. Je me sens en mauvaise condition physique.	Oui, c'est vrai	Non, ce n'est pas vrai
15. J'ai beaucoup de projets.	Oui, c'est vrai	Non, ce n'est Pas vrai
16. Je me fatigue facilement.	Oui, c'est vrai	Non, ce n'est pas vrai
17. J'accomplis peu.	Oui, c'est vrai	Non, ce n'est pas vrai
18. Je n'ai pas le goût de faire quoi que ce soit.	Oui, c'est vrai	Non, ce n'est pas vrai
19. Je suis facilement distraite.	Oui, c'est vrai	Non, ce n'est pas vrai
20. Je me sens en excellente condition physique.	Oui, c'est vrai	Non, ce n'est pas vrai

Merci de votre collaboration.

Name_____ ID#_____ Date_____ Age

PSQI

Instructions:
The following questions relate to your usual sleep habits during the past month *only*. Your answers should indicate the most accurate reply for the *majority* of days and nights in the **past month.**

Please answer all questions.

1. During the **past month**, when have you usually gone to bed at night?
   USUAL BED TIME : _____

2. During the **past month**, how long (in minutes) has it usually taken you to fall asleep each night?
   NUMBER OF MINUTES: _____

3. During the **past month**, when have you usually gotten up in the morning?
   USUAL GETTING UP TIME : _____

4. During the **past month**, how many hours of *actual sleep* did you get at night? (This may be different than the number of hours you spend in bed.)
   HOURS OF SLEEP PER NIGHT : _____

For each of the remaining questions, check the one best response. Please answer *all* questions.

5. During the **past month**, how often have you had trouble sleeping because you...
   (a) Cannot get to sleep within 30 minutes

Not during the past month_____	Less than once a week _____	Once or twice a week _____	Three or more times a week_____

   (b) Wake up in the middle of the night or early morning

Not during the past month_____	Less than once a week _____	Once or twice a week _____	Three or more times a week_____

(c) Have to get up to use the bathroom

Not during the past month_____	Less than once a week _____	Once or twice a week _____	Three or more times a week_____

(d) Cannot breathe comfortably

Not during the past month_____	Less than once a week _____	Once or twice a week _____	Three or more times a week_____

(e) Cough or snore loudly

Not during the past month_____	Less than once a week _____	Once or twice a week _____	Three or more times a week_____

(f) Feel too cold

Not during the past month_____	Less than once a week _____	Once or twice a week _____	Three or more times a week_____

(g) Feel too hot

Not during the past month_____	Less than once a week _____	Once or twice a week _____	Three or more times a week_____

(h) Had bad dreams

Not during the past month_____	Less than once a week _____	Once or twice a week _____	Three or more times a week_____

(i) Have pain

Not during the past month_____	Less than once a week _____	Once or twice a week _____	Three or more times a week_____

(j)

Not during the past month_____	Less than once a week _____	Once or twice a week _____	Three or more times a week_____

Other reason(s) please describe_____

How often during the **past month** have you had trouble sleeping because of this?

Not during the past month_____	Less than once a week _____	Once or twice a week _____	Three or more times a week_____

6. During the **past month**, how would you rate your sleep quality overall?

Very good _____
Fairly good_____
Fairly bad _____
Very bad _____

7. During the **past month**, how often have you taken medicine (prescribed or over the counter) to help you sleep?

Not during the past month_____	Less than once a week _____	Once or twice a week _____	Three or more times a week_____

8. During the **past month**, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?

Not during the past month_____	Less than once a week _____	Once or twice a week _____	Three or more times a week_____

9. During the **past month**, how much of a problem has it been for you to keep up enough enthusiasm to get things done?

No problem at all_____

Only a very slight problem_____

Somewhat of a problem_____

A very big problem_____

10. Do you have a bed partner or roommate?

No bed partner or roommate_____

Partner/roommate in other room____

Partner in same room, but not same bed___

Partner in same bed____

If you have a roommate or bed partner, ask him/her how often in the **past month** you have had...

(a) Loud snoring

Not during the past month_____	Less than once a week _____	Once or twice a week _____	Three or more times a week_____

(b) Long pauses between breaths while asleep

Not during the past month_____	Less than once a week _____	Once or twice a week _____	Three or more times a week_____

(c) Legs twitching or jerking while you sleep

Not during the past month_____	Less than once a week _____	Once or twice a week _____	Three or more times a week_____

(d) Episodes of disorientation or confusion during sleep

Not during the past month_____	Less than once a week _____	Once or twice a week _____	Three or more times a week_____

(e) Other restlessness while you sleep; please describe

Not during the past month_____	Less than once a week _____	Once or twice a week _____	Three or more times a week_____

Patkey: _____ Date: _____

PSQI

Directives:
Les questions suivantes portent sur vos habitudes de sommeil du dernier mois *seulement*. Vos réponses devraient décrire de façon la plus exacte possible *la majorité* des jours et des nuits du **dernier mois.**

Veuillez s'il vous plait répondre à toutes les questions.

1. Au cours du dernier mois, à quelle heure vous êtes-vous habituellement couché le soir?
   HEURE HABITUELLE DU COUCHER: _____

2. Au cours du dernier mois, combien de temps (en minutes) cela vous a-t-il habituellement pris pour vous endormir chaque soir?
   NOMBRE DE MINUTES: _____

3. Au cours du dernier mois, à quelle heure vous êtes-vous habituellement levé(e) le matin?
   HEURE HABITUELLE DU LEVER: _____

4. Au cours du dernier mois, combien d'heures avez-vous réellement dormi la nuit? (Ce nombre peut être différent de celui passé au lit.)
   HEURES DE SOMMEIL PAR NUIT: _____

Pour chacune des questions suivantes, veuillez cocher la meilleure réponse. Veuillez répondre à chaque question.

5. Au cours du dernier mois, combien de fois avez-vous eu de la difficulté à dormir parce que ...

(a) Vous ne pouviez pas vous endormir en dedans de 30 minutes

Pas au cours du dernier mois _____	Moins d'une fois par semaine _____	Une ou deux fois par semaine _____	Trois fois ou plus par semaine _____

(b) Vous vous réveilliez dans le milieu de la nuit ou tôt le matin

Pas au cours du dernier mois _____	Moins d'une fois par semaine _____	Une ou deux fois par semaine _____	Trois fois ou plus par semaine _____

(c) Vous aviez à vous lever pour aller à la toilette

Pas au cours du dernier mois _____ Moins d'une fois par semaine _____ Une ou deux fois par semaine _____ Trois fois ou plus par semaine _____

(d) Vous ne pouviez pas respirer confortablement

Pas au cours du dernier mois _____ Moins d'une fois par semaine _____ Une ou deux fois par semaine _____ Trois fois ou plus par semaine _____

(e) Vous toussiez ou ronfliez bruyamment

Pas au cours du dernier mois _____ Moins d'une fois par semaine _____ Une ou deux fois par semaine _____ Trois fois ou plus par semaine _____

(f) Vous aviez trop froid

Pas au cours du dernier mois _____ Moins d'une fois par semaine _____ Une ou deux fois par semaine _____ Trois fois ou plus par semaine _____

(g) Vous aviez trop chaud

Pas au cours du dernier mois _____ Moins d'une fois par semaine _____ Une ou deux fois par semaine _____ Trois fois ou plus par semaine _____

(h) Vous aviez fait des mauvais rêves

Pas au cours du dernier mois _____ Moins d'une fois par semaine _____ Une ou deux fois par semaine _____ Trois fois ou plus par semaine _____

(i) Vous aviez des douleurs

Pas au cours du dernier mois _____ Moins d'une fois par semaine _____ Une ou deux fois par semaine _____ Trois fois ou plus par semaine _____

(j) Veuillez décrire toutes autres raisons:

_____

Au cours du dernier mois, combien de fois avez-vous eu de la difficulté à dormir à cause de ces raisons?

Pas au cours du dernier mois _____ Moins d'une fois par semaine _____ Une ou deux fois par semaine _____ Trois fois ou plus par semaine _____

6. Au cours du dernier mois, comment évalueriez-vous, dans l'ensemble la qualité de votre sommeil?

Très bonne _____
Assez bonne_____
Assez mauvaise_____
Très mauvaise_____

7. Au cours du **dernier mois**, combien de fois avez-vous eu à prendre des médicaments (avec ou sans ordonnance) pour vous aider à dormir?

Pas au cours du dernier mois _____ Moins d'une fois par semaine _____ Une ou deux fois par semaine _____ Trois fois ou plus par semaine _____

8. Au cours du **dernier mois**, à quelle fréquence avez-vous eu de la difficulté à rester éveillé(e) pendant que vous conduisiez, mangiez un repas, ou participiez à une activité sociale?

Pas au cours du dernier mois _____ Moins d'une fois par semaine _____ Une ou deux fois par semaine _____ Trois fois ou plus par semaine _____

9. Au cours du **dernier mois**, à quel point a-t-il été un problème pour vous de maintenir assez d'enthousiasme pour accomplir ce que vous aviez à faire?

Pas au cours du dernier mois _____ Moins d'une fois par semaine _____ Une ou deux fois par semaine _____ Trois fois ou plus par semaine _____

10. Partagez-vous votre lit ou votre chambre?

Pas de partenaire de lit ou colocataire _____
Partenaire/colocataire dans une autre chambre _____
Partenaire dans la même chambre mais pas dans le même lit_____
Partenaire dans le même lit _____

Si vous partagez votre chambre ou votre lit avec quelqu'un, demandez-lui la fréquence à laquelle, au cours du dernier mois, vous avez ...

(a) Ronflé bruyamment

Pas au cours du dernier mois _____ Moins d'une fois par semaine _____ Une ou deux fois par semaine _____ Trois fois ou plus par semaine _____

(b) Eu de longues pauses entre vos respirations pendant que vous dormiez

Pas au cours du dernier mois _____ Moins d'une fois par semaine _____ Une ou deux fois par semaine _____ Trois fois ou plus par semaine _____

(c) Eu des spasmes musculaires ou des mouvements saccadés des jambes pendant que vous dormiez

Pas au cours du dernier mois _____ Moins d'une fois par semaine _____ Une ou deux fois par semaine _____ Trois fois ou plus par semaine _____

(d) Eu des épisodes de désorientation ou confusion pendant que vous dormiez

Pas au cours du dernier mois _____ | Moins d'une fois par semaine _____ | Une ou deux fois par semaine _____ | Trois fois ou plus par semaine _____

(e) D'autres agitations pendant que vous dormiez; veuillez les décrire: _____

_____

Pas au cours du dernier mois _____ | Moins d'une fois par semaine _____ | Une ou deux fois par semaine _____ | Trois fois ou plus par semaine _____

Name: _____ Date: _____

PSS-10

Instructions: The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate *how often* you felt or thought a certain way. Although some of the questions are similar, there are differences between them and should treat one as a separate question. The best approach is to answer fairly quickly. That is, don't try to count up the number of times you felt a particular way, rather indicate the alternative that seems like a reasonable estimate.For each question choose from the following alternatives.

0 = never
1 = almost never
2 = sometimes
3 = fairly often
4 = very often

1. In the last month, how often have you been upset because of something that happened unexpectedly?	0	1	2	3	4
2. In the last month, how often have you felt that you were unable to control the important things in your life?	0	1	2	3	4
3. In the last month, how often have you felt nervous and "stressed"?	0	1	2	3	4
4. In the last month, how often have you felt confident about your ability to handle your personal problems?	0	1	2	3	4
5. In the last month, how often have you felt that things were going your way?	0	1	2	3	4
6. In the last month, how often have you found that you could not cope with all the things that you had to do?	0	1	2	3	4
7. In the last month, how often have you been able to control irritations in your life?	0	1	2	3	4
8. In the last month, how often have you felt that you were on top of things?	0	1	2	3	4
9. In the last month, how often have you been angered because of things that happened outside of your control?	0	1	2	3	4
10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome then?	0	1	2	3	4

Nom: _____ Date: _____

PSS-10

Instructions: Ces questions portent sur les sentiments et les pensées que vous avez éprouves au cours du dernier mois. Dans chaque cas, nous vous prions d'indiquer la fréquence a laquelle vous êtes senti ou avez pense ainsi. Malgré la similarité dans les questions, elles sont différentes et doivent être traitées comme étant distinctes l'une de l'autre. Essayez de répondre rapidement et choisissez le nombre qui vous semble approprie.

0 = jamais
1 = presque jamais
2 = parfois
3 = assez souvent
4 = très souvent

1. Au cours du dernier mois, à quelle fréquence avez-vous été ennuyé parce que quelque chose est survenue à l'improviste?	0	1	2	3	4
2. Au cours du dernier mois, à quelle fréquence avez-vous ressenti que vous étiez incapable de contrôler les aspects importants de votre vie?	0	1	2	3	4
3. Au cours du dernier mois, à quelle fréquence vous êtes-vous sent nerveux ou stressé?	0	1	2	3	4
4. Au cours du dernier mois, à quelle fréquence vous êtes-vous senti confiant quant à votre aptitude à faire face aux problèmes personnels ?	0	1	2	3	4
5. Au cours du dernier mois, à quelle fréquence avez-vous ressenti que les choses allaient à votre façon?	0	1	2	3	4
6. Au cours du dernier mois, à quelle fréquence avez-vous trouve que vous ne pouviez faire face a toutes les choses que vous deviez accomplir?	0	1	2	3	4
7. Au cours du dernier mois, à quelle fréquence avez-vous été en mesure de contrôler les irritations dans votre vie?	0	1	2	3	4
8. Au cours du dernier mois, à quelle fréquence avez-vous ressenti que vous étiez au-dessus de vos affaires?	0	1	2	3	4
9. Au cours du dernier mois, à quelle fréquence avez-vous été en colère parce que les choses étaient au-delà de votre contrôle?	0	1	2	3	4
10. Au cours du dernier mois, à quelle fréquence avez-vous ressenti que vos difficultés s'empilaient à un tel point que vous ne pouviez les surmonter?	0	1	2	3	4

Patkey:_____ **Date:** _____

SOCIAL SUPPORT

How often is each of the following types of support available to you? (Check ONE answer for EACH statement).

	None of the time	Little of the time	Some of the time	Most of the time	All of the time
1. Someone you can count on to listen to you when you need to talk.					
2. Someone who shows you love and affection					
3. Someone to give you information to help you understand a situation.					
4. Someone whose advice you really want.					
5. Someone to help with daily chores if you were sick.					
6. Someone to share your most private worries and fears.					
7. Someone to do something enjoyable with.					

Patkey: _____ **Date:** _____

Questionnaire sur le support social

Veuillez indiquer jusqu'à quel point chacun des types de support suivant vous est disponible. (Cochez UNE réponse pour CHAQUE énoncé).

	Jamais	*Rarement*	*Parfois*	*Souvent*	*Toujours*
1. Quelqu'un sur qui compter lorsque vous avez besoin de parler.					
2. Quelqu'un vous démontrant de l'amour et de l'affection.					
3. Quelqu'un pour vous donner de l'information vous permettant de mieux comprendre une situation difficile.					
4. Quelqu'un à qui vous demandez des conseils.					
5. Quelqu'un pour vous aider dans les travaux ménagers si vous êtes malade.					
6. Quelqu'un avec qui partager vos soucis et vos craintes personnelles.					
7. Quelqu'un avec qui faire des activités plaisantes.					

ID._____ Date :_____

ACLS-PAQ

In this section we would like to ask about your current physical activity and exercise habits that you perform regularly, at least once a week. Please answer as accurately as possible. Circle your answer or supply a specific number when asked.

EXERCISE/PHYSICAL ACTIVITY

6. For the last three months, which of the following moderate or vigorous activities have you performed regularly? *(Please circle YES for all that apply and NO if you do not perform the activity; provide an estimate of the amount of activity for all marked YES. Be as complete as possible.)*

Walking
NO__YES___ How many sessions per week? _____

How many miles (or fractions) per session? _____
Average duration per session? _____(minutes)

What is your usual pace of walking? *(Please circle one)*

CASUAL or STROLLING (<2 mph)	AVERAGE or NORMAL (2 to 3 mph)	FAIRLY BRISK (3 to 4 mph)	BRISK or STRIDING (4 mph or faster)

Stair Climbing
NO___YES ___ How many flights of stairs do you climb UP each day?
(1 flight = 10 steps)

Jogging or Running
NO__ YES ___ How many sessions per week?
How many miles (or fractions) per session?
Average duration per session?_____ (minutes)

Treadmill
NO__YES ___ How many sessions per week?
Average duration per session?_____ (minutes)
Speed?_____(mph) Grade?_____(%)

Bicycling
NO___YES ___ How many sessions per week?
How many miles (or fractions) per session?
Average duration per session?_____ (minutes)

Swimming Laps
NO___YES___ How many sessions per week?
How many miles (or fractions) per session?

Average duration per session?_____ (minutes)

Aerobic Dance/Calisthenics/Floor Exercise
NO__YES ___ How many sessions per week?
Average duration per session?_____ (minutes)

Moderate Sports
(e.g. Leisure volleyball, golf (not riding), social dancing, doubles tennis)
NO___YES __ How many sessions per week?
Average duration per session?_____ (minutes)

Vigorous Racquet Sports
(e.g. Racquetball, singles tennis)
NO___YES ___ How many sessions per week?_____
Average duration per session?_____ (minutes)

Other Vigorous Sports or Exercise Involving
Running (e.g. Basketball, Soccer)
NO___YES___ Please specify:_____
How many sessions per week?_____

Average duration per session?_____(minutes)

Other Activities
NO___YES___ Please specify:_____
How many sessions per week?_____

Average duration per session?_____(minutes)

Weight Training
(Machines, free weights)
NO___YES____ How many sessions per week?
Average duration per session?_____ (minutes)

Household Activities (Sweeping, vacuuming, washing clothes, scrubbing floors)
NO____YES _____ How many hours per week?_____

Lawn work and Gardening
NO_____YES _____ How many hours per week?_____

2. How many times a week do you engage in vigorous physical activity long enough to work up a sweat?_____ *(Times per week)*

Patkey: _____ *Date:* _____

ACLS-PAQ

Dans cette section, nous vous posons des questions concernant les activités physiques et l'exercice que vous faites actuellement, de façon régulière, au moins une fois par semaine. Veuillez répondre le plus précisément possible. Veuillez encercler votre réponse ou donner le chiffre exact lorsque demandé.

EXERCICE/ACTIVITÉS PHYSIQUES

1. Au cours des trois derniers mois, lesquelles des activités modérées et rigoureuses suivantes avez-vous pratiquées de façon régulière? *(Veuillez encercler OUI pour chacune des activités que vous avez pratiquées et estimer le nombre de fois que vous l'avez faite. Si vous n'avez pas fait l'activité, veuillez encerer NON. Soyez le plus précis(e) que possible.)*

La Marche

NON OUI → Combien de sessions par semaine?

_____

Combien de miles (ou fractions) par session?

_____

Durée moyenne de la session?

_____(minutes)

Quel est votre pas habituel de marche? *(Veuillez encercler)*

LENT ou DE PROMENADE (<2 mph)	MOYEN ou NORMAL (2 à 3 mph)	ASSEZ RAPID (3 à 4 mph)	TRÈS RAPIDE ou À GRANDS PAS (4 mph ou plus)

Monter les Escaliers

NON OUI → Combien d'étages montez-vous à chaque jour?

_____

(1 étage = 10 marches)

Le Jogging ou La Course

NON OUI → Combien de sessions par semaine?

_____

Combien de miles (ou fractions) par session?

_____

Durée moyenne de la session?
_____(minutes)

Le Tapis Roulant
NON **OUI** → Combien de sessions par semaine? _____
Durée moyenne de la session?
_____(minutes)
Vitesse? _____(mph) Grade? _____(%)

La Bicyclette
NON **OUI** → Combien de sessions par semaine?
_____
Combien de miles (ou fractions) par session?
_____
Durée moyenne de la session?
_____(minutes)

La Nage
NON **OUI** → Combien de sessions par semaine?
_____
Combien de miles (ou fractions) par session?
_____
(880 verges = 0.5 miles)
Durée moyenne de la session?
_____(minutes)

La Dance Aérobique/Gymnastique/Exercices au Sol
NON **OUI** → Combien de sessions par semaine?
_____
Durée moyenne de la session?
_____(minutes)

Les Sports Modéré (ex. volleyballl, golf (à pied), dance sociale, tennis en double)
NON **OUI** → Combien de sessions par semaine?
_____
Durée moyenne de la session?
_____(minutes)

Les Sports à Raquette Vigoureux (ex. racquetball, tennis en simple)
NON **OUI** → Combien de sessions par semaine? _____
Durée moyenne de la session? _____(minutes)

Autres Sports Vigoureux ou Exercice avec Course (ex. basketball, soccer)
NON **OUI** ➔ Veuillez spécifier:_____
Combien de sessions par semaine? _____
Durée moyenne de la session? _____(minutes)

Autres Activités
NON **OUI** ➔ Veuillez spécifier: _____
Combien de sessions par semaine? _____
Durée moyenne de la session? _____(minutes)

Entraînement avec Poids et Altères (Machine, poids libres)
NON **OUI** ➔ Combien de sessions par semaine? _____
Durée moyenne de la session? _____(minutes)

Activités Ménagères (Balayage, aspirateur, lessive, lavage de planchers)
NON **OUI** ➔ Combien d'heures par semaine?_____

Jardinage et Entretien de la Cours
NON **OUI** ➔ Combien d'heures par semaine? _____

2. Combien de fois par semaine faites-vous de l'activité physique vigoureuse suffisamment longtemps pour en transpirer? _____*(Nombre de fois par semaine)*

APPENDICE D

HAMILTON DEPRESSION RATING SCALE

STRUCTURED INTERVIEW GUIDE FOR THE

HAMILTON DEPRESSION RATING SCALE (SIGH-D)

Name_____

I.D.:_____

Interviewer:_____

Date:_____

OVERVIEW: I would like to ask you some questions about the past week. How have you been feeling since last (day of week).

1. DEPRESSED MOOD (feelings of sadness, hopelessness, helplessness, worthlessness)

QUESTIONS	RATING SCALE
• **What's your mood been like this past week?**	0- Absent
• Have you been feeling down or depressed?	1- These feeling states indicated only on questioning
• Sad? Hopeless?	2- These feeling states spontaneously reported verbally
• In the last week, how often have you (use PATIENT'S TERM)? Every day? All day?	3- Communicates feeling states non-verbally – ie, through facial expression, posture, voice, and tendency to weep
• Have you been crying at all?	4- VIRTUALLY ONLY these feeling states are evident from spontaneous verbal and nonverbal communication

If depressed mood is scored 1-4, ask the following additional questions to establish duration of current condition:

- How long have you been feeling this way?

2. WORK AND ACTIVITIES

QUESTIONS	RATING SCALE
• **How have you been spending your time this past week (when not at work)?**	0- No difficulty
• Have you felt interested in doing (those things), or do you feel you have to push yourself to do them?	1- Thoughts and feelings of incapacity, fatigue or weakness related to activities, work, or hobbies
• Have you stopped doing anything you used to do> (If YES): Why?	2- Loss of interest in activities, hobbies, or work – reported by the patient, either directly or indirectly, in listlessness, indecision, and vacillation; feels he has to push self to work or activities
• Is there anything you look forward to?	3- Decrease in actual time spent in activities or decrease in productivity. In hospital, patient spends less than 3 hours per day in activities (hospital job or hobbies) exclusive of ward chores.
• (AT THE FOLLOW-UP TREATMENT VISIT): Has your interest been back to normal?	4- Stopped working because of present illness. In hospital, no activities except ward chores, or fails to perform ward chores unassisted.

3. GENITAL SYMPTOMS (such as loss of libido, menstrual disturbances)

QUESTIONS	RATING SCALE
• **How has your interest in sex been this past week? I'm not asking about performance, but about your interest in sex – how much do you think about it?**	0- Absent
• Has there been any change in your interest in sex from when you were not depressed?	1- Mild
• Is it something you have thought much About? (IF NO:) Is that usual for you?	2- Severe

4. SOMATIC SYMPTOMS GASTROINTESTINAL

QUESTIONS	RATING SCALE
• **How has your appetite been this past week?**	0- None
• What about compared to your usual appetite?	1- Loss of appetite but eating without encouragement
• Have you had to force yourself to eat?	2- Difficulty eating without urging
• Have other people had to urge you to eat?	

5. LOSS OF WEIGHT **(OUTPATIENTS)**

QUESTIONS	RATING SCALE
• **Have you lost any weight since this depression began? (IF YES): How much?**	0- No weight loss
• (IF NOT SURE): Do you think your clothes are nay looser on you?	1- Probable weight loss associated with present illness
• (AT THE FOLLOW-UP VISIT): Have you gained any of the weight back?	2- Definite (according to patient) weight loss
	3- Not assessed

6. INSOMNIA **(EARLY)**

QUESTIONS	RATING SCALE
• **How have you been sleeping over the last week? Have you had any trouble falling asleep at the beginning of the night?**	0- No difficulty falling asleep
• Right after you go to bed, how long has it been taking you to fall asleep?	1- Complains of occasional difficulty falling asleep – ie, more than ½ hour
• How many nights this week have you had trouble falling asleep?	2- Complains of nightly difficulty falling asleep

7. INSOMNIA **(MIDDLE)**

QUESTION	RATING SCALE
• **During the past week, have you been waking up in the middle of the night? (IF YES): Do you get out of bed? What do you do? Only to go to the bathroom?**	0- No difficulty
• When you get back in bed, are you able to fall right back asleep?	1- Complains of being restless and disturbed during the night
• Have you felt your sleeping has been restless or disturbed some night?	2- Waking during the night – getting out of bed for any reason except to void

8. INSOMNIA **(LATE)**

QUESTION	RATING SCALE
• **What time have you been waking up for the last time, this** past **week?**	0- No difficulty
• (IF EARLY): Is this with an alarm clock, or do you just wake up yourself?	1- Waking in early hours of morning but goes back to sleep
• What time do you usually wake up, that is, before you got depressed?	2- Unable to fall asleep again if patient gets out of bed

9. GENERAL SOMATIC SYMPTOMS

QUESTION	RATING SCALE
• **How has your energy been this past week?**	0- None
• Have you been tired all the time?	1- Heaviness in limbs, back, or head. Backaches, headaches, muscle aches; loss of energy, fatigability
• This week, have you had any backaches, or muscle aches?	2- Any clear-cut symptom
• This week, have you felt any heaviness in your limbs, back or head?	

10. FEELING OF GUILT

QUESTIONS	RATING SCALE
• **How have you been especially critical of yourself this past week, feeling you have done things wrong, or let others down? (IF YES): What have your thoughts been?**	0- Absent
• Have you been feeling guilty about anything that you have done or not done?	1- Self-reproach, feels he has let people down
• Have you thought that you have brought this (depression) on yourself in some way?	2- Ideas or guilt or rumination over past errors or sinful deeds
• Do you feel you're being punished by being sick?	3- Present illness is a punishment. Delusions of guilt.

	4- Hears accusatory or denunciatory voices, or experiences threatening visual hallucinations

11. SUICIDE

QUESTIONS	RATING SCALE
• **This past week, have you had any thoughts that life is not worth living, or that you would be better off dead?**	0- Absent
• What about having thoughts of hurting or even killing yourself? (IF YES): What have you thought about?	1- Feels life is not worth living
• Have you actually done anything to hurt yourself?	2- Wishes to be dead or has any thoughts of possible death to self
	3- Suicidal ideas or gesture
	4- Attempts at suicide

12. ANXIETY **(PSYCHIC)**

QUESTIONS	RATING SCALE
• **Have you been feeling especially tense of irritable this past week?**	0- No difficulty
• Have you been worrying a lot about	1- Subjective tension and irritability

little unimportant things, things you wouldn't ordinarily worry about?	
• (IF YES:) Like what for example?	2- Worrying about minor matters
	3- Apprehensive attitude apparent in face or speech
	4- Fears expressed without questioning

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13. ANXIETY SOMATIC

QUESTIONS	RATING SCALE
• **In the past week, have you had any physical symptoms? (READ LIST, PAUSING AFTER EACH SYMPTOM FOR REPLY AND CIRCLE EACH SYMPTOM THAT IS ACKNOWLEDGED):**	0- Absent
• Dry mouth, gas, indigestion, diarrhea, stomach cramps, belching • Heart palpitations, headaches • Hyperventilating, sighing • Having to urinate frequently • Sweating	1- Mild
• How much have these things been bothering you this past week?	2- Moderate
• How bad have they gotten?	3- Severe
• How much of the time, or how often, have you had them?	4- Incapacitating

14. HYPOCHONDRIASIS

• **In the past week, how much have your thoughts been focused on your physical health or how your body is working (as compared to your normal thinking)?**	0- Absent
• Do you complain much about how you feel physically?	1- Self-absorption (bodily)
• Have you found yourself asking for help with things you could really do yourself? (IF YES): Like what, for example?	2- Occupation with health
• How often has this happened?	3- Frequent complaints, requests for help
	4- Hypochondriacal delusions

15. INSIGHT

• **Rating based on observations during interview**	0- Acknowledges being depressed and ill OR not currently depressed
	1- Acknowledges illness but attributes cause to bad food, climate, overwork, virus, need for rest, etc.
	2- Denies being ill at all

16. RETARDATION (slowness of thought and speech; impaired ability to concentrate; decreased motor activity)

QUESTIONS	RATING SCALE
• **Rating based on observations during interview**	0- Normal speech and thought
	1- Slight retardation at interview
	2- Obvious retardation at interview
	3- Interview difficult
	4- Complete stupor

17. AGITATION

QUESTIONS	RATING SCALE
• **Rating based on observations during interview.**	0- None
	1- Fidgetiness
	2- Playing with hands, hair, etc.
	3- Moving about, cannot sit still
	4- Hand-wringing, nail-biting, hair-pulling, biting of lips

TOTAL 17-ITEM HAMILTON DEPRESSION SCORE:_____

STRUCTURED INTERVIEW GUIDE FOR THE

HAMILTON DEPRESSION RATING SCALE (SIGH-D)

Name_____ **I.D.:**_____

Interviewer:_____ Date:_____

DIRECTIVES: J'aimerais vous poser des questions à propos de la semaine qui vient de passer. Comment vous sentez-vous depuis (jour de la semaine) dernier?

1. HUMEUR DÉPRESSIVE (tristesse, sentiment d'être sans espoir, impuissant, auto-dépréciation).

QUESTIONS	RATING SCALE
• Comment a été votre humeur au cours de cette semaine qui vient de passer?	0 – Absente
• Vous-êtes vous senti "down" ou déprimée?	1-Ces états affectifs ne sont signalés que si l'on interroge le sujet.
• Triste? Sans espoir?	2-Ces états affectifs sont signalés verbalement spontanément.
• Au cours de la dernière semaine, à quelle fréquence avez-vous (utiliser le(s) EXPRESSION(S) DE LA PATIENTE)? À chaque jour? Toute la journée?	3-Le sujet communique ces états affectifs non verbalement, par exemple par son expression faciale, son attitude, sa voix et sa tendance à pleurer.
• Avez-vous pleuré?	4-Le sujet ne communique pratiquement que ces états affectifs dans ses communications spontanées verbales et non verbales.

Si l'humeur dépressive est coté 1-4, poser les questions suivantes pour établir la durée de la condition actuelle:

- Depuis combien de temps vous sentez-vous comme ça?

2. TRAVAIL ET ACTIVITÉS

QUESTIONS	RATING SCALE
• Au cours de la semaine dernière, comment avez-vous passé le temps (quand vous n'étiez pas au travail) ?	0 – Pas de difficulté
• Avez-vous ressenti de l'intérêt pour (ces choses), ou avez-vous eu à vous pousser pour les faire?	1-Pensées et sentiments d'incapacité, fatigue ou faiblesse se rapportant à des activités professionnelles ou de détente.
• Avez-vous arrêté de faire des choses que vous faisiez avant? (SI OUI): Pourquoi?	2-Perte d'intérêt dans les activités professionnelles ou de détente – ou bien décrite directement par le malade, ou indirectement par son apathie, son indécision et ses hésitations (il a l'impression qu'il doit se forcer pour avoir une activité).
• Est-ce qu'il y a des choses auxquelles vous avez hâte?	3-Diminution du temps d'activité ou diminution de la productivité. A l'hôpital, coter 3 si le malade ne passe pas au moins 3 h par jour à des activités (aide aux infirmières ou thérapie occupationnelle, à l'exclusion des tâches de routine de la salle).
• (LORS DU SUIVI): Est-ce que votre intérêt est redevenu à normal?	4-A arrêté son travail en raison de sa maladie actuelle. A l'hôpital, coter 4 si le malade n'a aucune autre activité que les tâches de routine de salle, ou s'il est incapable d'exécuter ces tâches de routine sans être aidé.

3. SYMPTOMES GENITAUX (symptômes tels que: perte de libido, troubles mentruels).

QUESTIONS	RATING SCALE
• Au cours de la semaine dernière, comment a été votre intérêt pour la sexualité? Je ne m'informe pas au sujet de votre perfomance, mais plutôt au sujet de votre intérêt envers la sexualité - combien y avez-vous pensé?	0 – Absents
• Y a t'il eu un changement dans votre intérêt envers la sexualité a comparé à quand vous n'étiez pas déprimée?	1- Légers
• Est-ce que c'est quelque chose auquel vous avez pensé? (SI NON): Est-ce comme ça habituellement?	2- Graves

4. SYMPTOMES SOMATIQUES GASTO-INTESTINAUX

QUESTIONS	RATING SCALE
• **Comment a été votre appétit au cours de la semaine dernière?**	0 – AUCUN
• Comment est-ce comparable à votre appétit habituel?	1- Perte d'appétit, mais mange sans y être poussé par les infirmières. Sentiment de lourdeur abdominale.
• Avez-vous eu à vous forcer pour manger? • Est-ce que d'autres personnes ont eu à vous pousser pour manger?	2- A des difficultés à manger en l'absence d'indications du personnel. Demande ou a besoin de laxatifs, de médicaments intestinaux ou gastriques.

5. PERTE DE POIDS (d'après les dires du malade) **(OUTPATIENTS)**

QUESTIONS RATING SCALE

• **Avez-vous perdu du pois depuis le début de cette dépression? (SI OUI): Combien?**	0 – Pas de perte de poids.
• (SI PAS CERTAINE): Croyez-vous que vos vêtements sont plus amples sur vous?	1- Perte de poids probable liée à la maladie actuelle.
• (LORS DU SUIVI): Avez-vous repris le pois que vous aviez perdu?	2- Perte de poids certaine (suivant ce que dit le sujet).
	3- NON ÉVALUÉ

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6. INSOMNIE DU **DÉBUT** DE LA NUIT

7. QUESTIONS RATING SCALE

• **Comment a été votre sommeil au cours de la semaine dernière? Avez-vous eu de la difficulté à vous endormir en début de nuit?**	0 – Pas de difficulté à s'endormir.
• Combien de temps prenez-vous à vous endormir une fois couchée?	1- Se plaint de difficultés éventuelles à s'endormir, par exemple de mettre plus d'une demi-heure.
• Combien de nuits cette semaine avez-vous eu de la difficulté à vous endormir?	2- Se plaint d'avoir chaque soir des difficultés à s'endormir.

7. INSOMNIE DU **MILIEU** DE LA NUIT

QUESTION	RATING SCALE
• **Au cours de la semaine dernière, vous êtes-vous réveillée en plein milieu de la nuit? (SI OUI): Sortez-vous du lit? Que faites-vous? Seulement pour aller à la toilette?**	0- Pas de difficulté.
• Lorsque vous vous recouchez, êtes vous capable de vous rendormir?	1- Le malade se plaint d'être agité et troublé pendant la nuit.
• Trouvez-vous que votre sommeil a été agité ou troublé?	2- Il se réveille pendant la nuit (coter 2 toutes les fois où le malade se lève du lit –sauf si c'est pour uriner).

8. INSOMNIE DU **MATIN**

QUESTION	RATING SCALE
• **À quelle heure vous êtes-vous réveillée pour la dernière fois la semaine dernière?**	0- Pas de difficulté.
• (SI TÔT): Est-ce avec un réveil matin (bébé), ou vous réveillez-vous toute seule?	1- Se réveille de très bonne heure le matin, mais se rendort.
• À quelle heure vous réveillez-vous habituellement, avant d'être déprimée.	2- Incapable de se rendormir s'il se lève.

9. SYMPTOMES SOMATIQUES GÉNÉRAUX

QUESTION	RATING SCALE
• **Comment a été votre niveau d'énergie au cours de la semaine dernière?**	0- Aucun.
• Avez-vous été fatiguée tous le temps?	1- Lourdeur dans les membres, dans le dos ou la tête. Douleours dans le dos, céphalées, douleurs musculaires. Perte d'énergie et fatigabilité.
• Avez-vous eu des maux de dos ou de muscles cette semaine? • Avez-vous ressenti de la lourdeur dans vos membres, votre dos ou votre tête?	2- Coter 2 au cas où n'importe quel symptôme est net.

10. SENTIMENTS DE CULPABILITÉ

QUESTIONS	RATING SCALE
• **Comment avez-vous été particulièrement auto-critique cette semaine, avec le sentiment d'avoir fait des choses incorrectement ou d'avoir déçu les autres? (SI OUI): Quelles ont été vos pensées?**	0 – Absente
• Vous êtes-vous sentie coupable à propos de quelque chose que vous aviez ou n'aviez pas fait?	1- S'adresse des reporches à lui-même, a l'impression qu'il a causé un préjudice

	à des gens.
• Pensez-vous que vous avez provoquer cette (dépression) d'une façon ou d'une autre?	2- Idées de culpabilité ou rumination sur des erreurs passées ou sur des actions condamnables.
• Avez-vous le sentiment que la maladie est votre punition?	3- La maladie actuelle est un punition. Idées délirantes de culpabilité.
	4- Entend des voix qui l'accusent ou le dénoncement et/ou des hallucinations visuelles menaçantes.

11. SUICIDE

QUESTIONS RATING SCALE

• **Au cours de la semaine dernière, avez-vous des pensées comme quoi que la vie ne vaut pas le peine d'être vécue, ou que vous seriez mieux d'être morte?**	0 – Absente
• Avez-vous pensé à vous faire mal ou à même vous tuer? (SI OUI): À quoi avez-vous pensé?	1- A l'impression que la vie ne vaut pas la peinse d'être vécue.
• Avez-vous fait quelque chose pour vous faire mal?	2- Souhaite être mort ou équivalent; toute pensée de mort possible dirigée contre lui-même.
	3- Idées ou geste de suicide.
	4- Tentatives de suicide (coter 4 toute tentative sérieuse).

12. ANXIÉTÉ PSYCHIQUE

QUESTIONS	RATING SCALE
• Vous êtes-vous sentie particulièrement tendue ou irritable au cours de la semaine dernière?	0 – Aucun trouble.
• Vous êtes-vous inquiétée à propos de plusieurs petites choses sans importance, choses auxquelles vous ne vous inquiéteriez pas d'habitude?	1-Tension subjective et irritabilité (anxiété légère).
• (SI OUI): Comme quoi par exemple?	2- Se fait du souci à propos de problèmes mineurs (anxiété modérée).
	3- Attitude inquiète, apparente dans l'expression faciale et le langage (anxiété sévère).
	4- Peurs exprimées sans qu'on pose de questions (anxiété invalidante).

13. ANXIÉTÉ SOMATIQUE

QUESTIONS	RATING SCALE
• Au cours de la semaine dernière, avez-vous eu des symptômes physiques? (LIRE LA LISTE ET FAIRE UNE PAUSE APRÈS CHAQUE SYMPTÔME POUR ATTENDRE LA RÉPONSE ET ENCERCLER CHAQUE SYMPTÔME RECONNU):	0 – Absente
• Bouche sèche, gaz, indigestion, diarrhée, crampes à l'estomac, rapports • Palpitations cardiaques, maux de tête • Hyperventilation, soupirs • Avoir le besoin d'uriner fréquemment • Transpiration	2- Discrète (gasto-intestinaux, bouche sèche, troubles digestifs, diarrhée, coliques, éructations).
• À quel point avez-vous été dérangée par ces choses au cours de la semaine dernière?	2- Moyenne
• Quel est le pire que c'est devenu?	3- Grave (cardio-vascualaires: palpitations, céphalées).
• Quelle proportion du temps, ou comment souvent, les avez-vous eu?	4- Frappant le sujet d'incapacité fonctionnelle (respiratoires: hyperventilation, soupirs, pollakiurie, transpiration).

14. HYPOCONDRIE

QUESTIONS	RATING SCALE
• **Au cours de la semaine dernière, combien vos pensées ont-elles été préoccupées par votre santé physique ou à comment votre corps fonctionne (à comparé à vos pensées normales)?**	0 – Absente

• Vous plaignez-vous à propos de comment vous vous sentez physiquement?	1- Attention concentrée sur son propre corps.
• Vous êtes-vous trouvez à demander de l'aide pour des choses que vous auriez pu faire vous-même? (SI OUI): Comme quoi, par exemple?	2- Préoccupatins sur sa santé.
• Combien de fois cela c'est-il produit?	3- Plaintes fréquentes, demandes d'aide, conviction d'être malade physiquement.
	4- Idées délirantes hypocondriaques.

15. PRISE DE CONSCIENCE

QUESTIONS	RATING SCALE
• **Rating based on observations during interview**	0 – Reconnaît qu'il est déprimé et malade.
	1- Reconnaît qu'il est malade, mais l'attibue à la nourriture, au climat, au surmenage, à un virus, à un besoin de repos, etc…
	2- Nie qu'il est malade.

16. RALENTISSEMENT (lenteur de la pensée et du langage; baisse de la faculté de concentration; baisse de l'activité motrice).

QUESTIONS	RATING SCALE
• **Rating based on observations during interview**	0 – Langage et pensées normaux
	5- Léger ralentissement à l'entretien.
	6- Ralentissement manifeste à l'entretien.
	3- Entretien difficile.
	4- Stupeur, entretien impossible.

17. AGITATION

QUESTIONS	RATING SCALE
• **Rating based on observations during interview.**	0 – Aucun
	1- Crispations, secousses musculaires.
	2- Joue avec ses mains, ses cheveux; absense de repos.
	3. Bouge, ne peut rester assis tranquille.
	4- Se tord les mains, ronge ses ongles, arrache ses cheveux, se mord les lèvres.

TOTAL 17-ITEM HAMILTON DEPRESSION SCORE:_____

APPENDICE E

ACCUSÉS DE RÉCEPTION DES ARTICLES

From: "Dekker, CS" <c.s.dekker@og.umcg.nl>
To: "Maria Dritsa" <mdritsa@epimgh.mcgill.ca>
Subject: RE: manuscript submission
Date: Tuesday, October 09, 2007 9:29 AM

Dear Dr. Maria Dritsa,

Thank you for submitting your manuscript to the Journal of Psychosmatic Obstetrics and Gynecology.
We will have a look at it to decide whether there will be a reviewtraject.
As soon as possible we will inform you.

Yours sincerely,

Siep Dekker

Managing Editor JPOG

Van: Maria Dritsa [mailto:mdritsa@epimgh.mcgill.ca]
Verzonden: donderdag 4 oktober 2007 17:22
Aan: JPOG
Onderwerp: manuscript submission

Dear Dr. Dekker,

Please find attached the electronic copy for a manuscript entitled: "Postpartum Fatigue: Prevalence, Correlates and Interventions for its Alleviation", that I and my colleagues are submitting to be considered in Journal of Psychosomatic Obstetrics & Gynecology.

I am also sending the 4 printed copies by mail.

The manuscript has not been previously published and is not being simultaneously submitted elsewhere.

Sincerely,

Maria Dritsa, M.Ed, Ph.D. candidate

McGill University Health Centre,

Division of Clinical Epidemiology,

687 Pine Avenue West, V Building,

Montreal, Quebec, Canada, H3A-1A1.

From: <alan-christensen@uiowa.edu>
To: <mdritsa@epimgh.mcgill.ca>
Subject: Your Submission
Date: Saturday, August 04, 2007 4:59 PM

Ref.: Ms. No. ABM-D-07-00002R1
Effects of a Home-Based Exercise Intervention on Fatigue in Postpartum Depressed Women: Results of a Randomized Controlled Trial.
Annals of Behavioral Medicine

Dear Dr. Dritsa,

I am pleased to inform you that I am accepting your manuscript Effects of a Home-Based Exercise Intervention on Fatigue in Postpartum Depressed Women: Results of a Randomized Controlled Trial. for publication in the Annals of Behavioral Medicine. There is one minor item for you to address prior to submitting the final version. You need to more clearly clarify what subsample constitute the sample in the efficacy analysis at post-treatment and 3-months. Please clarify this in both the text and in Table 3. Currently in Table 3 there is a designation for the 3-month post-treatment efficacy analysis but I do not believe this applies to the post-treatment analysis in that same table (and if it does, this should be clarified). I believe the designation at post-treatment had to do with proportion of sesions attended:sessions prescribed. It is possible that the journal office may require some additional editorial changes.

Please read the instructions below carefully. Complete the following steps to submit your manuscript for publication pending editorial office approval.

When you believe no further changes are necessary, and you have faxed your publication agreement and any necessary permissions, please log onto the website, select Submit Revision, and upload the final version of the manuscript. You must submit this final version in order to move your manuscript along in the publishing pipeline.

FORMAT:

1. Please ensure that the paper is in the format specified in the Publication Manual of the American Psychological Association (5th ed.) and that the references conform to the style of Index Medicus (please access the Instructions for Authors link at www.editorialmanager.com/abm for more details). After making all final changes to your manuscript file, log onto the website. On your main menu page, click on the

Submissions Needing Revision link and follow the steps to submit your final version including any corresponding figures, tables, drawings, or photographs.

FAX TO OUR OFFICE:

2. Please also be sure to include a copy of any outstanding permissions for adapted/reprinted materials. Copies of permission obtained for any previously published material (single-source quotes of 500 words or more, reprinted or adapted figures and tables, etc.). A sample permissions request form can be found through the Instructions for Authors link at www.editorialmanager.com/abm.

3. Sign and fax publication agreement. Please proceed to the homepage of Editorial Manager (http://www.editorialmanager.com/abm) and download the Publication Agreement. Please fax to Angela Autry at 510-204-9024 (this item may not be submitted online). Note that the Publication Agreement form requires signatures of all the authors.

Congratulations on a nice study and manuscript. I look forward to seeing it in print!

Sincerely

Alan Christensen, Ph.D.
Editor-in-Chief
Annals of Behavioral Medicine

Comments from the Editors and Reviewers:

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January 25, 2007

Dr. Maria Dritsa
McGill University Health Centre
Division of Clinical Epidemiology,
687 Pine Avenue West, V Building,
Montreal

Dear Dr. Dritsa,

RE: Effects of Supervised Home-Based Exercise on Fatigue in Postpartum Depressed Women: Who is More Likely to Benefit and Why? (101/07)

We have received your manuscript for possible publication in the Archives of Women's Mental Health. Thank you for considering our Journal for possible publication of your manuscript.

The manuscript has now been sent out for peer review. We expect to be able to notify you of the reviewers' decisions in three months time.

Thank you again for submitting your paper to our journal.

Cordially,

[Original signed & read]

Meir Steiner, MD, PhD, FRCPC
Professor of Psychiatry & Behavioural Neurosciences
and Obstetrics & Gynecology, McMaster University and
Director of Research, Department of Psychiatry
Director, Women's Health Concerns Clinic
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Liste des références

Addington, A.M., Gallo, J.J., Ford, D.E., & Eaton WW. (2001). Epidemiology of unexplained fatigue and major depression in the community: The Baltimore ECA follow-up, 1981-1994. *Psychological Medicine, 31*, 1037-1044.

Albright C., Maddock, J.E., & Nigg, C.R. (2005). Physical activity before pregnancy and following childbirth in a multiethnic sample of healthy women in Hawaii. *Women & Health, 42,* 65-110.

American College of Sports Medicine American College of Sports Medicine Position Stand (1998). The recommended quantity and quality of exercise for developing and maintaining cardiorespiratory and muscular fitness, and flexibility in healthy adults. *Medicine and Science in Sports Exercise*, *30*, 975-91.

Ansara, D., Cohen, M.M., Gallop, R., Kun, R., & Schei, B.(2005). Predictors of women's physical health problems after childbirth. *Journal of Psychosomatic Obstetrics & Gynaecology, 26,* 115-125.

Barkhman, M., Rees, A, Stiles, W.B., Shapiro, D.A., Hardy, G.E., & Reynolds, S. (1996). Dose-effect relations in time-limited psychotherapy for depression. *Journal of Consulting and Clinical Psychology, 64,* 927-935.

Barney, L.J., Grifiths, K.M., Jorm A.F., & Christensen, H. (2006). Stigma about depression and its impact on help-seeking intentions. *Australian and New Zealand Journal of Psychiatry, 40,* 51-54.

Bensing, J.M., Hulsman, R.L., & Schreurs, K.M. (1999). Gender differences in fatigue: biopsychosocial factors relating to fatigue in men and women. *Medical Care, 37,* 1078-1083.

Berlin, A.A., Kop, W.J., & Deuster, P. (2006). Depressive mood and fatigue after exercise withdrawal: The potential role of decreased fitness. *Psychosomatic Medicine, 68*, 224-230.

Blumenthal, J.A., Fredrickson, M., Kuhn, C.M., Ulmer, R.L., Walsh-Riddle, M., & Appelbaum, M. (1990). Aerobic exercise reduces levels of cardiovascular and

sympathoadrenal response to mental stress in subjects without prior evidence of myocardial ischemia. *American Journal of Cardiology*, 65, 93-98.

Bozoky, I. & Corwin, E. (2002). Fatigue as a predictor of postpartum depression. *Journal of Obstetrics Gynecology & Neonatal Nursing, 31*, 436-443.

Brown, S., & Lumley, J. (2000) Physical health problems after childbirth and maternal depression at six to seven months postpartum. *British Journal of Obstetrics & Gynaecology, 107*, 1194-1201.

Cathébras, P.J., Robbins, J.M., Kirmayer, L. & Haton, B.C. (1992). Fatigue in primary care: Prevalence, psychiatric comorbidity, illness behavior, and outcome. *Journal of General Internal Medicine, 7*, 276-286.

Cook T.D. & Campbell, D.T. (1979). *Quasi-experimentation: Designs & analysis issues for field settings*. Boston MA: Houghton Mifflin Company.

Corwin, E.J., Bozoky, I., Pugh, L.C. & Johnston, N. (2003). Interleukin-1β elevations during the postpartum period. *Annals of Behavioral Medicine, 25*, 41-47.

Corwin, E.J., Brownstead, N., Barton, N., Heckard, S. & Morin K. (2005). The impact of fatigue on the development of postpartum depression. *Journal of Obstetrics Gynecology & Neonatal Nursing, 34*, 577-586.

Cox, J.L., Murray, D. & Chapman, G. (1993). A controlled study of the onset, duration and prevalence of postnatal depression. *British Journal of Psychiatry, 163*, 27-31.

Crespo, C.J., Andersen, R.E., Carer-Pokras, O., & Ainsworth, B.E. (2000). Race/ethnicity, social class and their relation to physical inactivity during leisure time: Results from the Third National Helath and Nutrition Examination Survey, 1988-1994. *American Journal of Preventive Medicine, 18*, 46-53.

Crews, D.J. & Landers D.M. (1987). A metanalytic review of aerobic fitness and reactivity to psychosocial stressors. *Medicine and Science in Sports and Exercise, 19*, S114- S120.

Da Costa, D., Lowensteyn, I., Abrahamowicz, M., Ionescu-Ittu, R., Dritsa, M., Rippen, N. et al. (2006). *A Randomized Clinical Trial of Exercise to Alleviate Postpartum Depression.* Manuscript Submitted for Publication.

Dallman P(1986). Biochemical basis for the manifestations of iron deficiency. *Annual Review of Nutrition, 6,* 13-40.

De Luca J. (2005). Fatigue: Its definition, its study and its future. In J De Luca (Ed), *Fatigue as a window to the brain* (pp. 319-326). Cambridge MA: The MIT Press.

Dennis, C.L & Chung-Lee L. (2006). Postpartum depression help-seeking barriers and maternal treatment preferences : A qualitative systematic review. *Birth, 33,* 323-331.

Dennis, C.L. & Ross, L. (2005). Relationships among infant sleep patterns, maternal fatigue, and development of depressive symptomatology. *Birth, 32,* 187-193.

Dishman, R.K., Berthoud, H-R, Booth, F.W., Cotman C.W., Edgerton, V.R., Fleshner, M.R., et al., (2006). Neurobiology of exercise. *Obesity, 14,* 345-356.

Dunn, A.L., Trivedi, M.H., Kampert J.B., Clark, C.G., & Chambliss H.O (2005). Exercise treatment for depression: Efficacy and dose response. *American Journal of Preventive Medicine, 28,* 1-8.

Fulcher, K.Y. & White, P.D. (1997). Randomised controlled trial of graded exercise in patients with the chronic fatigue syndrome. *British Medical Journal, 314,* 1647-1652.

Gay, C.L., Lee, K.A., & Lee, S-Y. (2004). Sleep patterns and fatigue in new mothers and fathers. *Biological Research Nursing, 5,* 311-318.

Glazener, C.M.A., Abdalla, M., Stroud, P., Naji, S., Tempelton ,A., & Russell, I.T. (1995). Postnatal maternal morbidity: Extent causes, prevention and treatment. *British Journal of Obstetrics & Gynaecology, 102,* 282-287.

Groër, M., Davis, M., Casey, K., Short, B., Smith, K., & Groër, S. (2005). Neuroendocrine and immune relationships in postpartum fatigue. *MCN: American Journal of Maternal and Child Nursing, 30,* 133-138.

Hickie, I.B., Koschera ,A., Hadzi-Pavlovic, D., Bennett, B., & Loyd, A. (1999). The temporal stability and co-morbidity of prolonged fatigue: A longitudinal study in primary care. *Psychological Medicine*, *29*, 855-861.

Hillman C.H., Motl, R.W. Pontifex, M.B., Posthuma, D. Stubbe J.H. Boosma, D.I. et al. (2006). Physical activity and cognitive function in a cross-section of younger and older community-dwelling individuals. *Health Psychology, 25*, 678-687.

Jacobsen, P.B., Andrykowski, M.A., & Thors, C.L. (2004). Relationship of catastrophizing to fatigue among women receiving treatment for breast cancer. *Journal of Consulting and Clinical Psychology, 72,* 355-361.

Jacobson, N.S., Martell, C.R., & Dimidjian S. (2001). Behavioral activation treatment for depression: Returning to contextual roots. *Clinical Psychology: Science and Practice*, *8*, 255-270.

Kiecolt-Glaser, J., McGuire, L., Robles, T.F., & Glaser, R. (2002). Pychoneuroimmunology: psychological influences on immune function and health. *Journal of Consulting and Clinical Psychology, 70*, 537-547.

King, A.C., Taylor, C.B., & Haskell, W.L (1993). Effects of differing intensities and formats of 12 months of exercise training on psychological outcomes in older adults. *Health Psychology, 12,* 292-300.

Klimas N.G., Fletcher M.A., Maher, K. , & Lawrence R. (2005). Psychoneuroimmunology and Fatigue. In J De Luca (Ed), *Fatigue as a window to the brain* (pp. 281-298). Cambridge MA: The MIT Press.

Koltyn, K.F. & Schultes, S.S. (1997). Psychological effects of an aerobic exercise session and a rest session following pregnancy. *Journal of Sports Medicine and Physical Fitness*, *37*, 287-291.

Lange, G., Cook, D.B., & Natelson, B.H.(2005). Rehabilitation and treatment of fatigue. In J De Luca (Ed), *Fatigue as a window to the brain* (pp. 301-316). Cambridge MA: The MIT Press.

Lim, W., Hong, S., Nelesen, R., & Dimsdale JE (2005). The association of obesity, cytokine levels, and depressive symptoms with diverse measures of fatigue in healthy subjects. *Archives of Internal Medicine*, *25*, 910-915.

Lee, K.A. & Zaffke, M. (1999). Longitudinal changes in fatigue and energy during pregnancy and the postpartum period. *Journal of Obstetrics Gynecology & Neonatal Nursing, 28*, 183-191.

Lewinsohn, P.M. & Graf, M. (1973). Pleasant activities and depression. *Journal of Consulting and Clinical Psychology, 41,* 261-268.

McGovern, D., Dowd, B., Gjerdingen, D., Gross, C.R., Kenney, S., Ukestad, L., et al. (2006). Postpartum health of employed mothers 5 weeks after childbirth. *Annals of Family Medicine, 4,* 159-167.

McIntyre, R.S., Konarski, J., Mancini, D.A., Zurowski, M., Giacobbe, P. Socznyska, J.K. et al. (2006). Improving outcomes in depression: A focus on somatic symptoms. *Journal of Psychosomatic Research, 60*, 279-282.

Mock,V., Frangakis, C., Davidson, N.E., Ropka, M.C., Pickett, M., Poniatowski, B., et al.(2005). Exercise manages fatigue during breast cancer treatment: A randomized controlled trial. *Psychooncology*, *14*, 464-477.

Mohr, D.C., Hart, S.L., & Goldenberg, A. (2003). Effects of treatment for depression on fatigue in multiple sclerosis. *Psychosomatic Medicine*, *65*, 542-547.

Moss, R.H. & Cronkite, RC. (1999). Symptom-based predictors of a 10-year chronic course of treated depression. *Journal of Nervous and Mental Disease, 187,* 360-368.

Nezu, A.M. (1989). A problem solving formulation of depression: A literature review and proposal of pluralistic model. *Clinical Psychology Review, 7*, 121-144.

Nierenberg, A.A., Keefe, B.R., Leslie, V.C., Alpert, J.E., Pava, J.A., Worthington, J.J. et al. (1999). Residual symptoms in depressed patients who respond acutely to Fluoxetine. *Journal of Clinical Psychiatry, 60,* 221-225.

Nies MA, Vollman, M., & Cook T. (1999). African American women's experience with physical activity in their daily lives. *Public Health Nursing, 16*, 23-31.

Oken, B.S., Kishiyama, S., Zajdel, D., Bourette, D., Carlsen, J., Haas, M., et al. (2004). Randomized controlled trial of yoga and exercise in multiple sclerosis. *Neurology*, *62*, 2058-2064.

Parks, P.L., Lenz, E.R., Milligan, R.A , & Han, H.R.(1999). What happens when fatigue lingers for 18 months after delivery? *Journal Obstetrics Gynecology & Neonatal Nursing, 28,* 87-93.

Pinto, B., Frierson, G.M., Rabin, C., Trunzo, J.J. , & Marcus, B.H. (2005). Home-based physical activity intervention for breast cancer patients. *Journal of Clinical Oncology*, *23*, 3577-3587.

Puetz, T.(2006). Physical activity and feelings of energy and fatigue: epidemiological evidence. *Sports Medicine, 36,* 767-780.

Puetz, T., O'Connor, P., & Dishman, R.K. (2006). Effects of chronic exercise on feelings of energy and fatigue: A quantitative synthesis. *Psychological Bulletin, 132*, 866-876.

Pugh, L.C. & Milligan, R. (1993). A framework for the study of childbearing fatigue. *Advances in Nursing Science, 15*, 60-70.

Righetti-Veltema, M., Conne-Perréard, E., Bousquet, A., & Manzano, J. (2002) Postpartum depression and mother-infant relationship at 3 months old. *Journal of Affective Disorder, 70*, 291-306.

Ross, L.E., Evans, S.E.G., Sellers, E.M., & Romach, M.K. (2003). Measurement issues in postpartum depression part 2: assessment of somatic symptoms using the Hamilton Ration Scale for Depression. *Archives of Women's Mental Health, 6,* 59-64.

Saurel-Cubizolles, M.J., Romito, P., Lelong, N., & Ancel, P.Y. (2000). Women's health after childbirth: A longitudinal study in France and Italy. *British Journal of Obstetrics & Gynaecology, 107*, 1202-1209.

Scharff D.P, Homan, S., Kreuter, M., & Brennan, L. (1999). Factors associated with physical activity in women across the life span: Implications for program development. *Women & Health, 29*, 115-134.

Schwartz A.L., Meek, P.M., Nail, L.M., Fargo, J., Lundquist, M., Donofrio, M. et al., (2002). Measurement of fatigue: Determining minimally important clinical difference. *Journal of Clinical Epidemiology*, *55*, 239-244.

Schytt, E., Lindmark, G. , & Waldenstrom, U. (2005). Physical symptoms after childbirth: Prevalence and associations with self-rated health. *Journal of Obstetrics & Gynaecology*, *112,* 210-217.

Silverstein B. (2002). Gender differences in the prevalence of somatic versus pure depression: a replication. *American Journal of Psychiatry, 159* , 1051-1052

Stahl, S.M. (2002). The psychopharmacology of energy and fatigue. *Journal of Clinical Psychiatry, 63*, 7-8.

Statistiques Canada (2006). Femmes au Canada: rapport statisue fondé sur le sexe. (5eme ed.). Ottawa: Statistiques Canada.

Swain, A.M., O'Hara, M.W., Starr, K.R., & Gorman LL. (1997). A prospective study of sleep, mood, and cognitive function in postpartum and nonpostpartum women. *Obsterics & Gynecolology*, *90*, 381-386.

Thome, M. & Adler, B. (1999). A Telephone intervention to reduce fatigue and symptom distress in mothers with difficult infants in the community. *Journal of Advanced Nursing, 29*, 128-137.

Thompson, J.F., Roberts, C.I., Currie, M., & Ellwood, D.A. (2002). Prevalence and persistence of health problems after childbirth: Association with parity and method of birth. *Birth, 29*, 83-94.

Torres-Harding, S. & Jason, L.A. (2005). What is fatigue? History and epidemiology. In J De Luca (Ed.), *Fatigue as a window to the brain* (pp. 3-17). Cambridge MA: The MIT Press.

Troy, N.W. (1999). A comparison of fatigue and energy levels at 6 weeks and 14 and 19 months postpartum. *Clinical Nursing Research, 8*, 135-152.

Troy, N.W. & Dalgas-Pelish, P. (2003). The effectiveness of a self-care intervention for the management of postpartum fatigue. *Applied Nursing Research, 16*, 38-45.

Tsatsoulis, A. & Fountoulakis, S. (2006) The protective role of exercise on stress system dysregulation and comorbidities. *Annals of the New York Academy of Science, 1083*, 196-213.

Tulman, L., Fawcett, J., Groblewski, L., & Silverman, L. (1990). Changes in functional status after childbirth. *Nursing Research, 39,* 70-75.

Tylee, A., Gastpar, M., Lepine, J.P. , & Mendelwicz, J.(1999). DEPRES II (Depression Research in European Society II): A patient survey of the symptoms, disability and current management of depression in the community. DEPRES Steering Committee. *International Clinical Psychopharmacology, 14,* 139-151.

Urizar , G.G., Hurtz, S.Q., Ahn, D.K., King, A.C., Albright, C.L., & Atienza, A.A. (2005) .Influence of maternal stress on successful participation in a Physical Activity intervention the IMPACT project. *Women & Health, 42*, 63-82.

Wambach, K.A. (1998). Maternal fatigue in breastfeeding primiparae during the first nine weeks postpartum. *Journal of Human Lactation, 14*, 219-229.

Waters, M. & Lee, K.A. (1996). Differences in sleep disturbance and fatigue in nuliparous and multiparous women. *Journal of Nurse Midwifery, 41*, 364-367.

Wessely, S., Hotof, M., & Sharp, M (1998). *Chronic fatigue and its syndromes*. Oxford: Oxford University Press.

Weuve, J., Kang, J.H. Manson, J.E., Breteler M.M., Ware, J.H., & Grodstein, F. (2004). Physical activity, including walking , and cognitive function in older women. *JAMA, 292,* 1454-1461.

Willoughby S.G., Hailey, B.J., Mulkana, S., & Rowe J. (2002). The effects of laboratory-induced depressed mood state on response to pain. *Behavioral Medicine, 28,*23-31.